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JULY, 1920

THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

Use American Clays

R. T. VANDERBILT CO.
INCORPORATED
50 EAST 42nd STREET
NEW YORK

A white pulverized clay from our mine in Virginia.

Dried to a moisture content of about 3 per cent.

Suitable for coating book paper and filling book paper.

Low freight rates.

A special South Carolina grade—absolutely free from grit—color fully satisfactory for Newsprint paper.

It costs about $15 per ton delivered—a big saving over pulp.

It will give a better feel and finish to your sheet.

Clay Mines in Georgia, Virginia, South Carolina, Pennsylvania, Etc.

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Power, Labor, Worry,
Beater Bars, Jordan Filling

MAKE—

A Better Sheet
A Cleaner Sheet
More Paper
More Money

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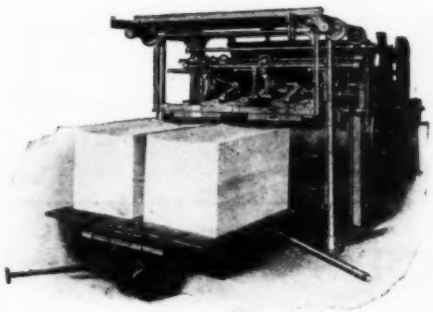
Unkle Improved Extractors

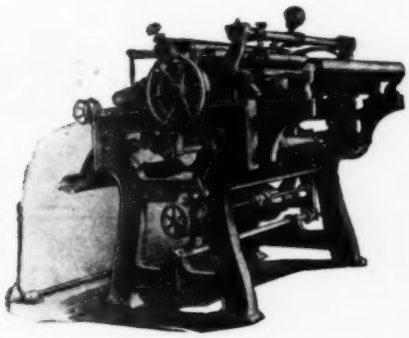
Particularly adapted for Board mills or News Print mills, but will effect a great saving in all kinds of mills.

You can **save** and **make**, and learn much to your advantage, as hundreds of other mills are now doing, by writing or wiring

The Griley-Unkle Engineering Co.

General and Sales Offices: Lancaster, Ohio





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NORTH PHILADELPHIA STATION
PHILADELPHIA, U. S. A.

Builders of Paper Machinery—Friction Clutches—Speed Changes

Vol. 2—No. 4

THE PAPER INDUSTRY

A. SCOTT DOWD
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of The Paper Industry

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comprising all and every Sulphite, Sulphate and Kraft pulp mill in Finland. Manufacturers of superior grades of Bleached and Unbleached Sulphites, Easy Bleaching Sulphates and Kraft Pulps.

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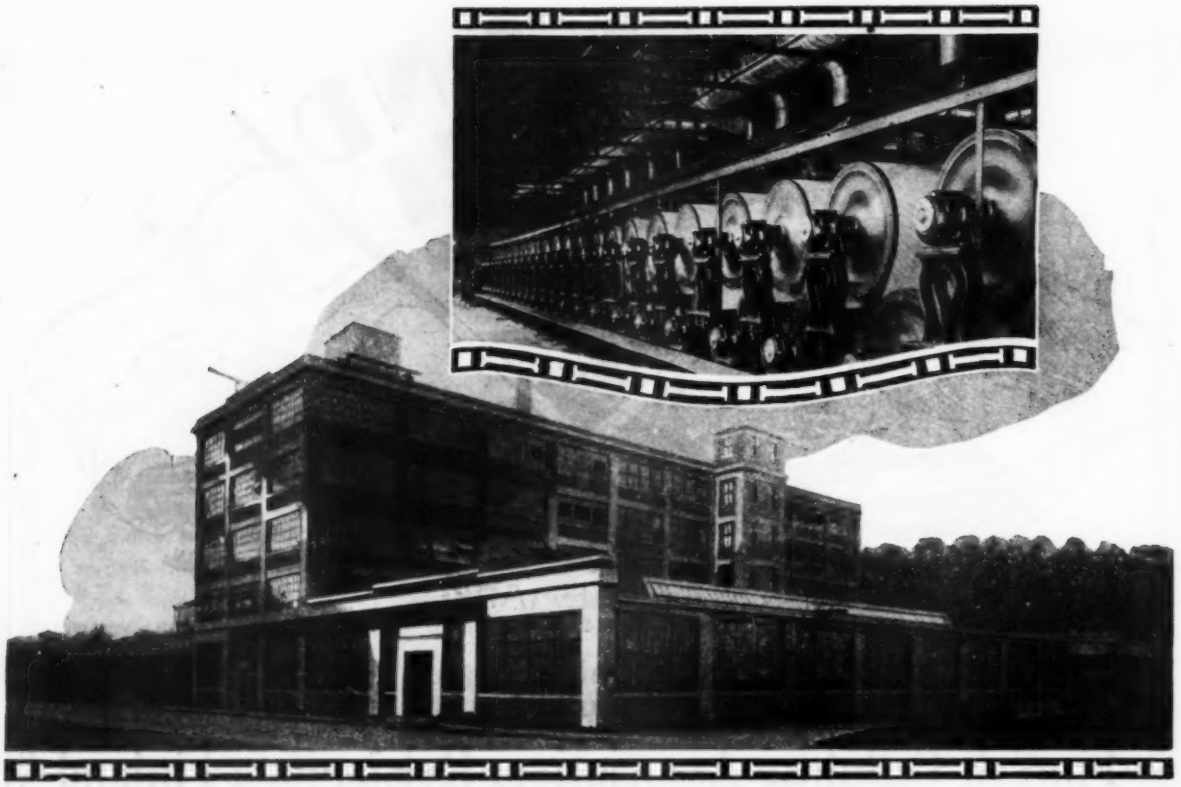
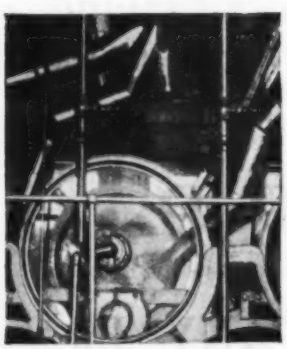


Charles Boldt Paper Mills, Cincinnati, O.

Increased Production Through Modern Methods

Clear air is playing an important part in the modern paper mill of today. In the Charles Boldt Paper Mill shown here, a SIROCCO Vapor Absorption system insures clear air in the paper room and better working conditions for employees. Warm air is circulated from a SIROCCO Fan and Heater Coils through air ducts directly onto the paper rolls eliminating all moisture which would otherwise rise to the ceiling, condense and fall back onto the finished stock.



Detail showing warm air ducts leading to paper roll

The commanding position which the Paper Mill occupies in the industry today means that every step should be taken which will insure a high quality product and more satisfactory working conditions. SIROCCO Equipment in the paper mill insures this.

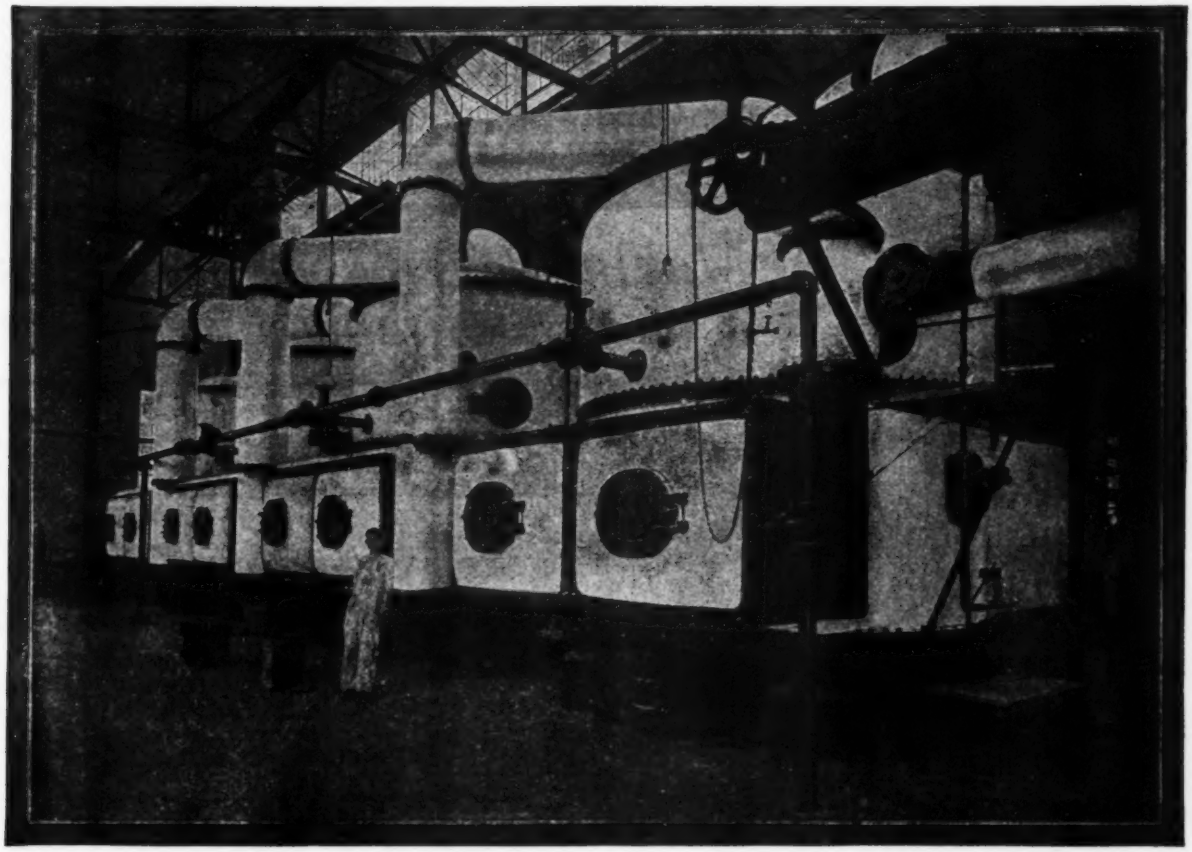
We have a new paper bulletin which gives details of ventilation in the paper mill with suggestions and photographs of particular interest to those interested in the paper industry. A copy will be sent upon request.

AMERICAN BLOWER COMPANY

DETROIT

"Sirocco"

TRADE MARK



Zaremba Achievement in the Pulp Industry

How Zaremba engineers provided a valuable development to the Paper Pulp Industry forms an interesting story—a story that has parallels only in Zaremba Co.'s achievements in other fields.

The use of resinous woods, such as Jack Pine, has been neglected, and in some cases has been prohibitive because of the liquor loss from severe foaming. Recognizing the tremendous utility of an evaporator which could handle foaming liquors properly, Zaremba engineers devised the Hughes Foam Arrester, which is now being furnished with soda pulp installations. The success of this apparatus demonstrates the extent to which the Paper Pulp Industry is indebted to our engineers.

Replace Worn Out Evaporators with "Zarembas"

Zarembas will pay for themselves by saving what old evaporators are losing through low soda recovery due to liquor losses coupled with high cost of maintenance and repair.

Zaremba Evaporators are the recognized standard of the paper industry, owing to their simplicity, sturdiness, no liquor losses, and low cost of maintenance. Repeated installations for the leading concerns in the industry furnish the proof.

Scrap your obsolete equipment and put in the last word in Black Liquor Evaporators.

Write us for full particulars giving us complete information on your evaporator costs and results.

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Niagara Life Bldg. Buffalo, U. S. A.
New York Office 95-97 Liberty St.

ZAREMBA

EVAPORATORS **LEACHING CELLS**

A Nation Wide Service *for* Advertisers and Printers

Making your paper purchases a more profitable investment

THE most comprehensive paper service ever established has been inaugurated simultaneously in all of our branches clearing through headquarters in Chicago. It is for the firm who issues or prints advertising literature ranging from the smallest booklet up to catalogues the size of Montgomery Ward or Sears, Roebuck.

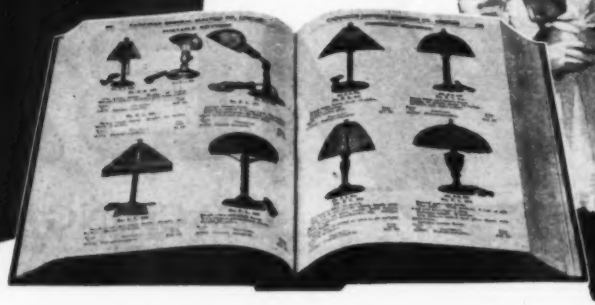
It covers the selection and use of the cheapest grades to paper and cover stock De Luxe, and every size and weight known to the paper business.

From folders to broadsides and from phantom weights to bristols as heavy as lumber, your every need is covered, as well as papers for every process of reproduction that will reproduce merchandise, products, or service, in a manner second only to the original.

The publisher will find our manufacturing service covers every grade of magazine book, from the cheapest to the best, any finish, any quality, any tonnage. Books, magazines, publications, each have a mission which is enhanced or retarded by the paper used.

SEAMAN SERVICE PAPERS

"For every printing need"



Seaman Paper Co.

1174, 208 South La Salle Street
Chicago

June 12, 1920
THE SATURDAY EVENING POST
Big Produ
Loss
Stopped by a Boy
Every time a high priced operator stops his machine and goes to get oil, cost of production increases—return on investment is reduced. Think how many times this loss is multiplied in your plant every day.
One boy, with a Wayne Portable Oil Tank, delivers lubricating service to every man and machine—and conserves all this production waste.
This applies to any plant in any industry that uses machines and machine tools. But this is some and efficient saving only. Note these actual material savings effected by Wayne equipment:
Your oil, stored in Wayne dust tight, fireproof tanks of steel, prevents waste by leakage on the floors, and saves the unstrained portion now lost in barrels and drums.
No matter what your storage and distributing needs are, there is a Wayne System to meet them. Production is the big word in industry today. Wayne Lubricating equipment will help you make it a reality in your plant. Complete information will be sent or expert representatives will call at your request.
Wayne Oil Tank and Pump Company
Fort Wayne, Indiana
Wayne
OIL STORAGE SYSTEMS

THE largest advertising medium in the world has been selected, but none is large enough, to tell industry the vital import of Wayne equipment at this time when peak efficiency must be sustained—when waste cannot be tolerated—when human labor is at a premium.

Read this message reproduced above. Then enlist the free advice of Wayne engineers.

WAYNE OIL TANK AND PUMP COMPANY

731 Canal Street **Fort Wayne, Ind.**

Cut Down Overhead

Handle Your Coal Mechanically

The

Godfrey System

will unload and store your coal at an average cost of 5 to 7 cents per ton. One man operates the entire system by means of a motor driven hoist. The operator, hoist and motor are on the ground, which permits of economy of installation and operation.

Your Gains

Saves Labor
Saves Time
Eliminates Demurrage Costs
Keeps Equipment Moving
Prevents Coal Shortage
Increases Production
Adds Profits

Our modern factory and trained engineering staff are at your disposal. Write us today for literature or let us send our representative to look over your plant and make suggestions. This we will do without charge or obligation.

GODFREY CONVEYOR COMPANY

119 13th Street **ELKHART, IND.**

EDITORIAL

Next President an Editor

THAT famous, old, pioneer commonwealth familiarly known as the "Buckeye," whose manufacturing centers, agricultural and mineral products make it one of the richest states in the Union has been placed in the unprecedented position of being sure that the next president will be a native of her soil. Five presidents have in the past been selected from her boundaries, a number which exceeds that from any other state. Four of these men were lawyers and the other a soldier. She now has given both the republican and democratic parties a man whose profession is that of a newspaper publisher and editor.

This fact is singular in two respects, for not only has it never happened that the two leading, opposing candidates have come from the same state, but neither has it occurred that a newspaper publisher has ever before been elected to the White House.

Senator Warren G. Harding, republican candidate for president and Governor James M. Cox, the democratic candidate are newspaper publishers by profession.

Senator Harding, who was born on November 2nd, 1865, at Corsica, Ohio, has been engaged in the newspaper business at Marion, Ohio, since 1884 and is president of the Harding Publishing Company of that city, publishers of the daily Star.

Governor Cox was born on March 31st, 1870, at Jacksonburg, Ohio, and began his career in a printing office. At one time, he was connected in an editorial capacity with the Cincinnati Enquirer. He bought the Dayton Daily News in 1898 and the Springfield Press-Republic in 1903, forming the News League of Ohio. His home is in Dayton.

Both of these gentlemen enjoy a wide circle of friends among the paper manufacturers. Mr. Cox is finishing his third term as governor and Mr. Harding has been a member of the United States Senate since 1915.

Necessity of Advertising

ADVERTISING today is a necessity and an asset. The time has arrived when the manufacturer and the merchant must carefully figure advertising cost, carry it in his budget as an expense just as essential as rent or labor, properly charging it against each product and article. Advertising has been hurt by emotional appropriations—by spasmodic flares. For instance, some men still advertise only when they have spare money and never put out a line when times are dull and they need business! The amount and nature of advertising is to be planned with the production scale. Only then can we stabilize manufacturing, merchandising, and advertising.

The name of the small merchant today who has foresight and judgment in the merchandising of his products may be as well-known as John Wanamaker in his particular locality, or even throughout the nation. His products are known by his advertising, and his success depends upon the merits of the products he furnishes to the customers that the advertising brings to him. And the manufacturer or merchant who is advertising sanely today is not only laying the foundation for greater business for himself, but is selling the public on his industry. His success will be the guide post for his competitors, and the post will always read, "Advertise."

EDWARD N. HURLEY.

To Our Customers and Friends:

In these times of stress when it seems impossible to fill orders as quickly as you would sometimes wish, we want you all to know that every effort is being made to serve you to the best of our ability, and that every ounce of our strength is being exerted with that thought in view—namely, to serve—so that you may always have on hand sufficient of the wires that are noted for their long runs, and which always make good our claim that

"Appleton Wires are Good Wires"

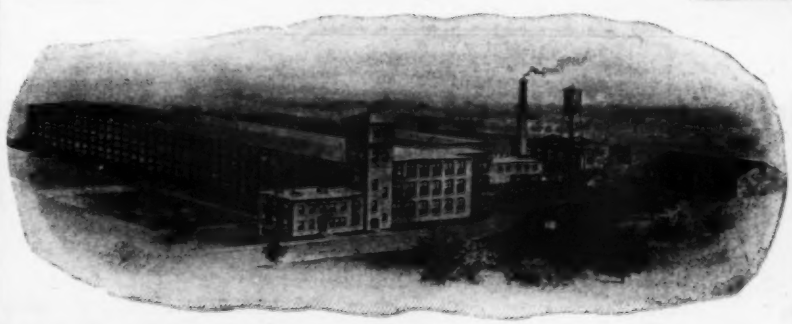
APPLETON WIRE WORKS
Appleton, Wis.

"ALBANY" Felts *and* Jackets *for* Paper & Pulp Mills

ALBANY FELTS are adapted for every type of Paper and Pulp Machine, and for every kind of stock. Every one is made of Pure Wool of the very best quality.

¶ Twenty-five years' experience in making Paper Makers Felts and Jackets has shown us how to make them as best suited to the needs of various kinds of machines and stock.

¶ Every possible effort is made to give our customers the best satisfaction and to weave into our Felts and Jackets the longest possible life.



ALBANY FELT CO.
ALBANY — NEW YORK

Pittsburgh Piping & Equipment Co.

Piping Manufacturers and Contractors

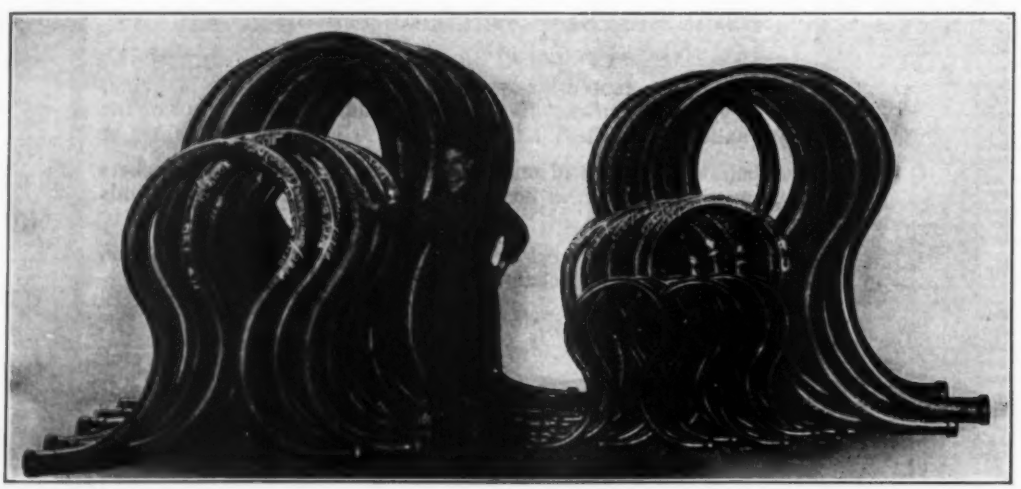
Main Office and Plant:
PITTSBURGH, PA.

Foundries:
GREENSBURG, PA.

YOUR NEXT PIPING ORDER

will be filled to your complete satisfaction if you specify

PITTSBURGH PIPING



Piping Work of Every Description

Write for "Tables of Piping Standards"—Series 19—if You Are an Executive or Chief Engineer. There Is No Obligation

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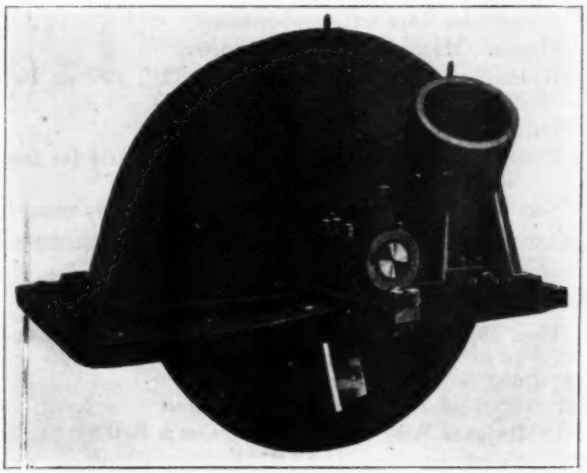
220 Broadway	Am. Trust Bldg.	Peoples Gas Bldg.	Monadnock Bldg.	Am. Trust Bldg.

WHEN YOU THINK OF PIPING THINK OF PITTSBURGH PIPING

Pulp and Paper Mill Machinery



Chippers

That produce clean, evenly cut chips, free from slivers.

Our patented improvements make this possible.

Made in
48", 84", 90" Sizes

Right or Left Hand
Three or Four Knives

Description on Request

We manufacture

Wet Machines

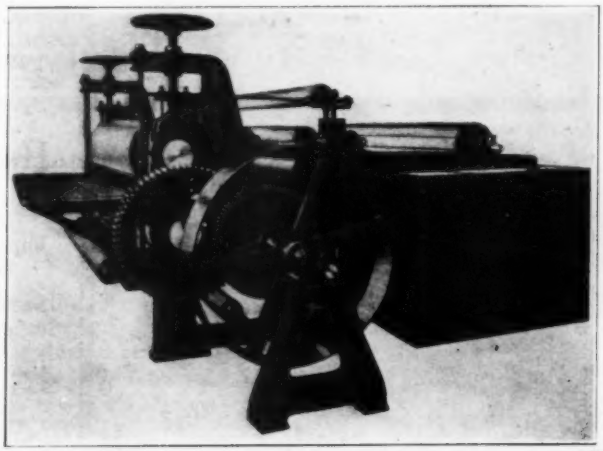
that give satisfaction

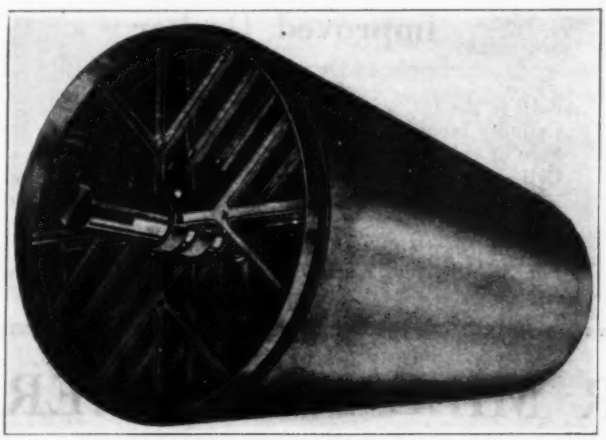
Single Cylinder
Double Cylinder

Any width face or diameter mould.

We also make a combination wet machine and decker.

Particulars on Request





Cylinder Moulds

Made on our special machinery—will stand long wear.

Hand sewed covers—Removable end Clamping Rings

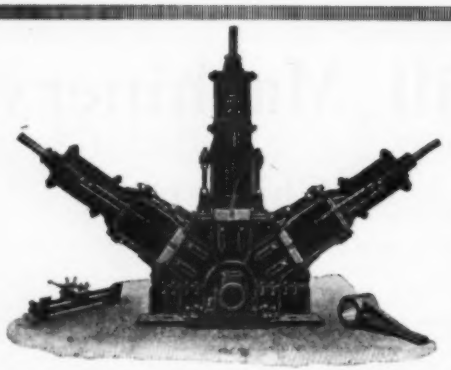
Give a smooth surface, therefore a longer life to your felt.

Satisfaction Guaranteed

We also manufacture the "WOLF (Patented) MOULD."

We also manufacture 3 and 4 pocket Grinders, Screens, Barkers, Pumps, Iron, Brass, Bronze and Lead Castings

UNION IRON WORKS Bangor, Maine



Standard Wood Pulp Grinder

Built in Three Sizes

Taking wood 24″, 30″ or 32″.
Bridge-trees—Are well proportioned.
Flanges—Made of steel, 40″ diameter.
Hydraulic Cylinders—Copper lined, 12″, 14″ or 16″ diameter.
Pillow Blocks—22″ length of bearing.
Pockets—Very heavy and designed particularly for free discharge of pulp.
Service—Continuous distinctive service is always assured.

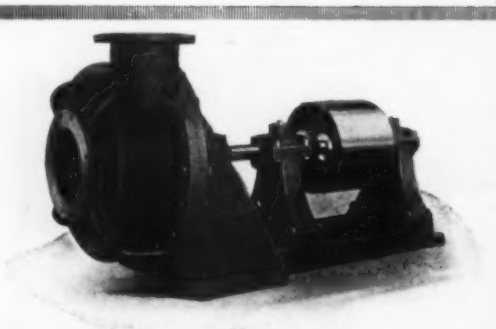
The Wood's Machine

Used as Pulp Thickeners, Savealls, Pulp Washers and Water Filters

ADVANTAGES:

Reduced Wire Costs	No Couch Roll
Enormous Capacity	Minimum Repairs
Only 2 H. P. Required	No Doctor
Works Automatically	Requires No Attention

TWENTY-THREE SOLD DURING THE PAST YEAR



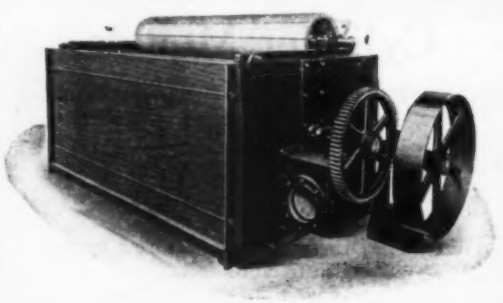
Heavy Duty Paper Mill Pumps

Built Especially for Handling Stock

Impeller—Extra wide, enclosed type and perfectly balanced against vibration and end thrust.

Suction Inlet—Is of large area, giving a free and easy entrance to same.

Our Pumps are economical in use, simple in construction, of very great durability and discharge continuous steady stream.



Improved Decker

Single or Double Cylinder Type

Built in the following sizes:
Cylinder mould diameter, 36″ or 40″.
Face of cylinder mould, 72″, 84″ or 96″.
Cylinder mould of best reinforced construction and properly supported with our latest design outside bearings.
Vat furnished either all wood or with cast iron ends.
For Stability and Efficiency our Improved Deckers are Unexcelled

PULP AND PAPER MILL MACHINERY
GLENS FALLS MACHINE WORKS
GLENS FALLS, NEW YORK

Whose Problem Is It?

IT is fast becoming a serious but interesting gamble among the mills as to how long they can continue to run and produce paper. They are individually making heroic efforts to keep going; resorting to every conceivable expedient to obtain cars, secure coal, and move raw materials into their plants.

We hear from a number of sources that various paper and pulp mills have purchased flat, gondola and box cars in some considerable quantities from the car and equipment builders; flat cars to transport wood, gondolas for coal, and box cars to move pulp, paper and supplies to and from the mills. Why are these private corporations purchasing these cars, which were formerly furnished by the railroads?

Because the railroads have no money to buy cars with.

Because they have no credit to get the money on.

Because the financial market is so drastically against them.

The mills have good cash reserves on hand. They have excellent credit and a market which will take all the pulp and paper they can produce at prices which will justify these investments, plus a good profit.

Privately owned cars are no innovation in the large industries, but they are a novel innovation to the smaller manufacturing plants throughout the country. Perhaps this innovation has come to stay. Perhaps this is one more step in solving the railway problem. Who knows?

If the general public will not allow the railroads just and profitable freight charges, from which they may obtain the funds necessary to buy cars, then industry must go without any more cars or purchase them privately, thus relieving the roads of that amount of investment.

More freight cars have recently been ordered by private corporations than by all the railroads combined.

But how about locomotives? Who is going to buy them? More freight cars demand more engines and more men to handle them. Where are they coming from? Railroads have no money to buy engines.

Industry can't spare any more men to operate the railroads.

Forty-two per cent of the workers in the United States are in farming, mining, forestry and fishing.

Twenty-five per cent in manufacturing.

Ten per cent in trade and merchandizing.

"Any radical change in these percentages is sure to cause trouble." Manufacturing is reaching out for more men. The country is demanding more production of commodities.

Tradesmen and merchandizers are down to their limit. "We need forty-two per cent of our workers to produce food and other raw products for the rest of us." Agricultural products have already risen to three times their previous prices and are going higher as a direct result of the scarcity of labor.

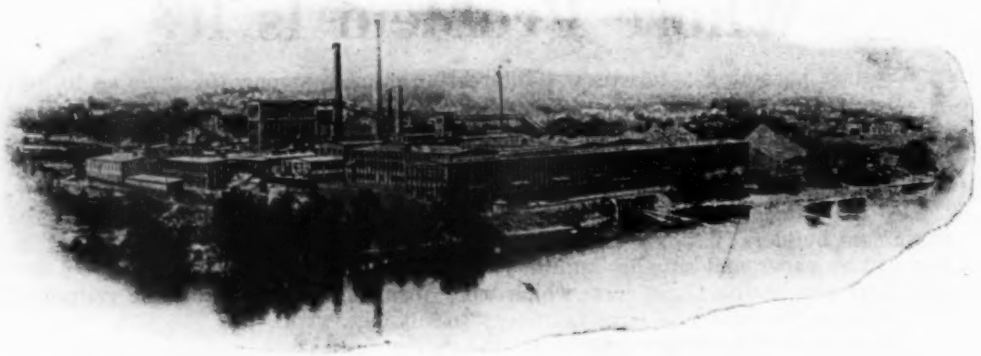
Then, again, more cars demand more rails to move them on, more sidetracks and terminals to house and handle them on. Where are they coming from?

In other words, how does it help the situation by increasing the cars enormously, and not increase proportionately the engines, tracks, terminals, equipment and labor to handle them? The answer must be, It does not! It's but an expedient, which gets loaded cars on the rails, to add to the already huge "frozen credits," tying up additional finances indefinitely.

What we should deal with is the principles of the railway science, not expedients. Our transportation problem has come upon us because we have violated the principles of scientific railroading. Our problem will continue to increase in gravity until we remove the railroads outside the influence of stupid, demigogic political and labor agitators.

Industry, the paper industry included, must slow down from now on, facing a probable complete shutdown this winter. No coal will do it. There is only coal enough moving to barely keep industry moving; no coal being stored. One western railroad system we know of should have 500,000 tons of coal in store today. It has none for winter use. Winter will find them taking every car on their rails to keep them moving. The government will distribute coal this winter, wherever it can find any, to keep its citizens from freezing.

Can't you see this drastic menace to industry which so plainly looms right ahead of you?



Oxford Paper Company

Mills at
RUMFORD
MAINE

Executive Offices
200 Fifth Avenue
NEW YORK

Manufacturers of

High Grade Machine Finish and S. and S. C. Book Paper

CAPACITY OF MILL, 275 TONS OF PAPER PER DAY

Nashwaak Pulp & Paper Co.
Limited

Manufacturers of

P

Canadian Bleached Sulphite

Mills: St. John, N. B., Canada

GENERAL SALES OFFICE
200 Fifth Avenue NEW YORK

Maine Coated Paper Co.

Manufacturers of

Polar, Hi-Tone and North Star Coated Book Papers

ALSO

Coated One or Two Sides Lithograph and Cover

Mills: Rumford, Maine

New York Sales Office: 200 FIFTH AVE.

Marathon Paper Mills Co.

Rothschild—Wisconsin

Paper Manufacturers

Carton and Paper Can Stock

Sulphite Bonds
Waxing Papers
Bleached-Specialties

Machine Glazed Plain and Watermarked Specialties

¶ One 100-inch Cylinder Machine, producing Solid Manilas, Single Lined and Double Lined Boards for Carton and Paper Can purposes.

¶ One 120-inch Fourdrinier Machine, producing Sulphite Bond, and Bleached Papers for special conversions purposes.

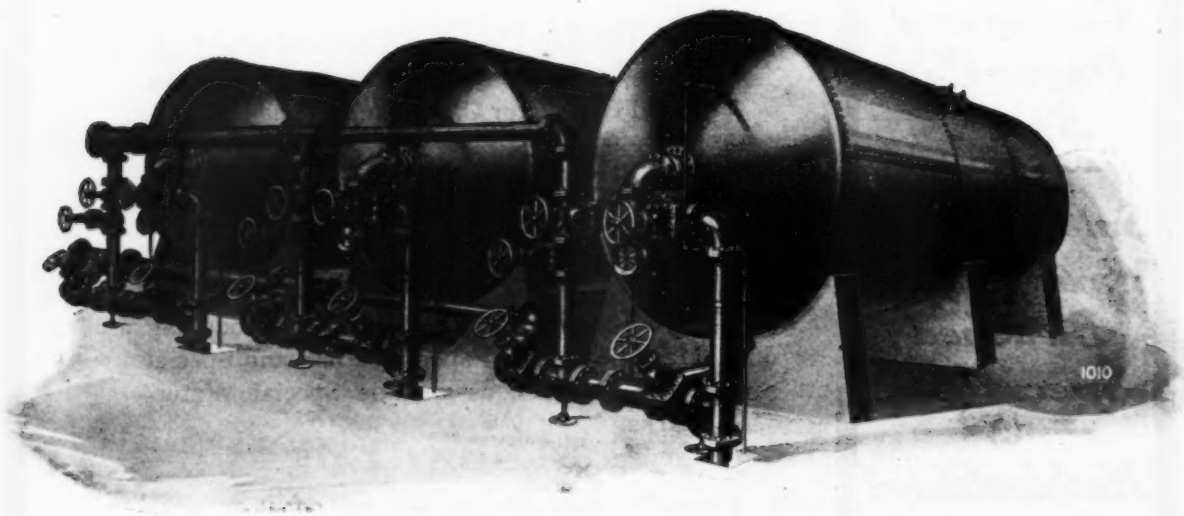
¶ Two 120-inch Yankee Machines, producing Machine Glazed Papers in Plain and Special Stock Designs, as well as Special Watermarks.

Daily Production, 200,000 lbs.

SALES OFFICE
CONWAY BUILDING,
CHICAGO

GRAVER
Water
Softening & Purification
HEADQUARTERS

GRAVER *Filters*



Graver Water Filters will deliver properly clarified water to meet every demand.

Graver Service begins with filling your request for information, extends through the analysis of your water conditions, provides for the proper installation and starting of the correct equipment, and continues throughout the full term use of the equipment.

Write for further information regarding the various types of Graver Filters.

GRAVER *Corporation*

(WM. GRAVER TANK WORKS · FOUNDED 1857)

Steel Tanks and General Steel Plate Construction
Water Softening and Purifying Equipment

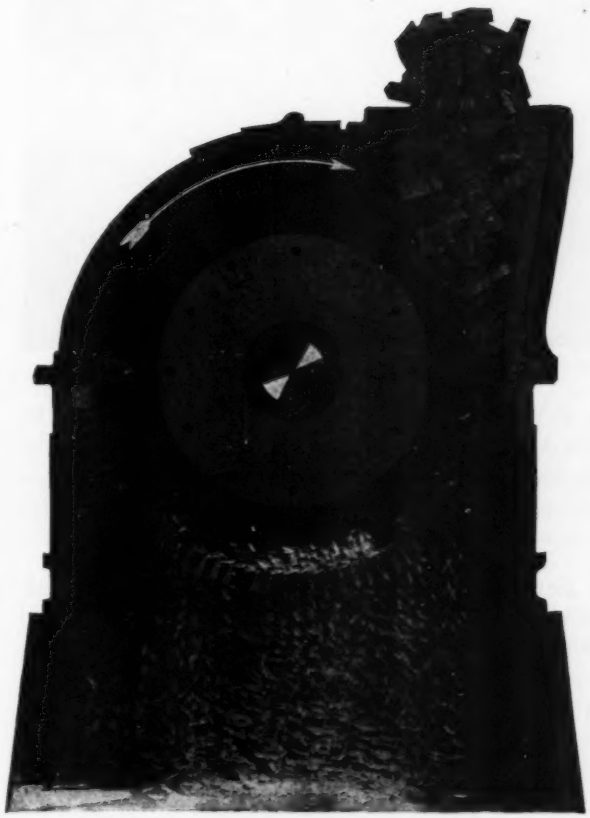
7-H

East Chicago, Indiana

Jeffrey TYPE "E"

Swing Hammer Shredder

(BALL BEARING)



Cross Section of Jeffrey Type "E" Shredder

For Reducing Wood Chips, Bark and Other Fibrous Materials

Insures High Percentage of Extraction—Uniform Product—Minimum of oversize—Small Loss of material in Fine Dust.

Ball Bearings Eliminate Bearing Troubles.

The Jeffrey Type "E" Shredder is fully described in our new Catalog No. 259-H, which also contains valuable engineering information, plant layouts and other data of service to Plant Managers and Superintendents.

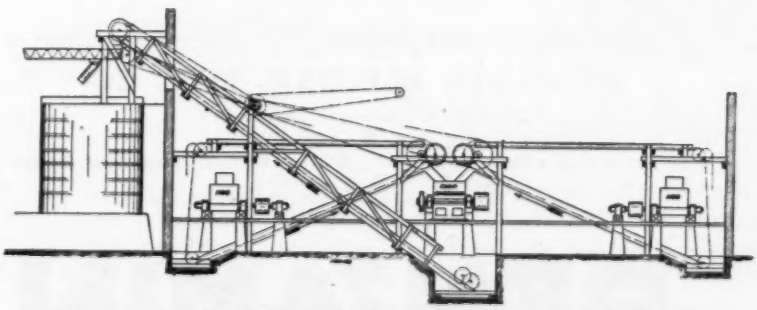


Diagram drawing showing an economical and desirable arrangement for Type "E" Shredder Installation

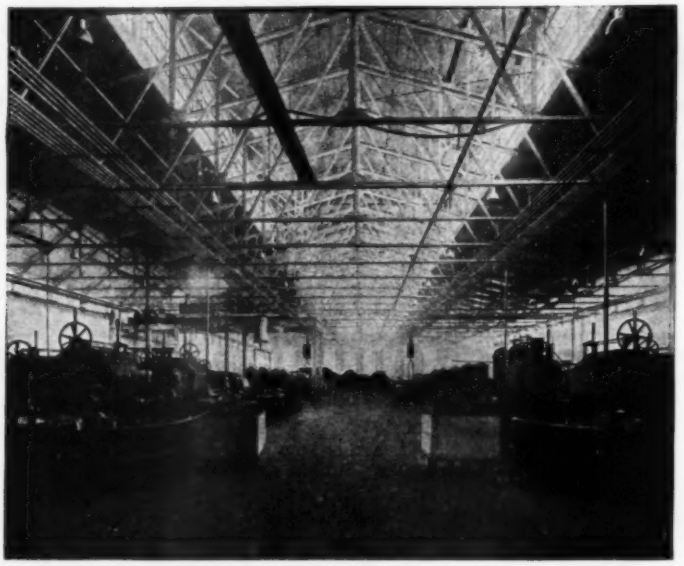
The Jeffrey Mfg. Company

813 North Fourth St.
Columbus, O.

New York
Boston
Philadelphia
Scranton
Pittsburgh
Cleveland
Charleston, W. Va.
Chicago
Los Angeles
St. Louis
Detroit
Birmingham
Dallas
Milwaukee
Denver
Montreal
Buffalo

Securing Correct Illumination *for* Making Paper

Seamless Deep Bowl Reflector Socket

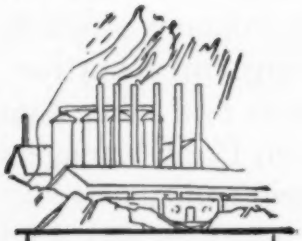


FOR EVERY condition under which the activities of industry may be correctly illuminated, there is a type of Benjamin Reflector designed and made to suit that condition—the line is complete.

Each Benjamin Reflector is designed with a specialized knowledge of the degree of illumination required in conjunction with the placing of the light sources.

For the paper industry there are many specially designed Benjamin Reflectors to meet the variety of conditions particular to this industry—each of them producing daylight illuminating efficiency during the dark hours.

Put your problems in correct illumination up to Benjamin.



BENJAMIN PRODUCTS

The following are divisions of Benjamin products on which we will be glad to send information:

- Industrial Lighting Division
- Electrical Division (including Benjamin Two-Way Plug)
- Pressed Steel Products Division
- Enameled Products Division
- Starrett Panel Board Division

For details, write the Advertising Department, 806 W. Washington Blvd., Chicago

BENJAMIN ELECTRIC MFG. CO.

Factories: Chicago and Desplaines, Ill.

Sales and Distribution Offices:

247 W. 17th St., New York — 806 W. Washington Blvd., Chicago

580-582 Howard St., San Francisco

Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Canada

The Benjamin Electric, Limited, London, England

BENJAMIN

Makers of Things More Useful

Wages and Production

THE question of wages must necessarily go side by side with production, for without production there can be no wages. The old conditions were changed somewhat during the war, but in order to get down to earth again and back to something like normal, we must finally base the subject of wages upon production.

One of the best papers that we have seen on this subject is an address by Charles Piez, of Chicago, before the U. S. Railroad Labor Board, and we believe is worthy of serious consideration, as it applies not only to the railroads, but to all of the industries, and in none of them more forcibly than that of the paper industry.

"The outcome of the Railroad Wage case, which is at present before your honorable body, is of such vast importance to the manufacturers and producers generally, that the Illinois Manufacturers' Association, through its Board of Directors, takes the liberty of submitting the following for the consideration of your Board:

"First: The practice of basing wages on the cost of living, without taking into account the work performed for the wages, is, in our opinion, at the very bottom of the present disturbed and unsatisfactory labor condition. It is usual now in presenting claims for wage advances, to attach an estimated family budget upon which the percentage of wage increase is predicated. Unfortunately this family budget is presented only to further the claims of a particular body, but we believe it to be the duty of your Board to consider where a universal application of the budget presented in the railroad case would lead.

"If, for instance, we accept the figures submitted by Mr. Lauck that $1,700 represents the lowest subsistence level and $2,500 the lowest comfort level for an American family, and base the scale of wages in the transportation service on the assumption that every man engaged in this service, no matter where he lives, whether married or single, is entitled to a wage based on a scale with those figures as minimums, would it not be fair to assume that every wage earner in every character of employment everywhere in this country is entitled to a scale based on that same minimum?

"From our experience as manufacturers we should say that if Mr. Lauck's budget were made the basis of a universal demand, the farms, the mines, and the industries would be wholly unable to meet it on a straight time basis.

"If this is true, then you would improve the living conditions of railroad employees by impairing the living conditions of all the other workers.

"Your Board can render a signal service to the country by indicating to these claimants that while wages should be equalized in those cases that have lagged behind in the wage readjustment, wages can't be paid unless they are earned, and that we can't get more out of the common pot than we put into it.

"Second: The divorce of wages from production has been one of the calamities of the war, for it has created in the mind of the wage earner the delusion that, irrespective of output, performance, or character of service rendered, he is entitled to live on a certain scale. Statisticians spend their time in developing elaborated lists of family requirements, instead of determining how wage increases based on these requirements can be paid.

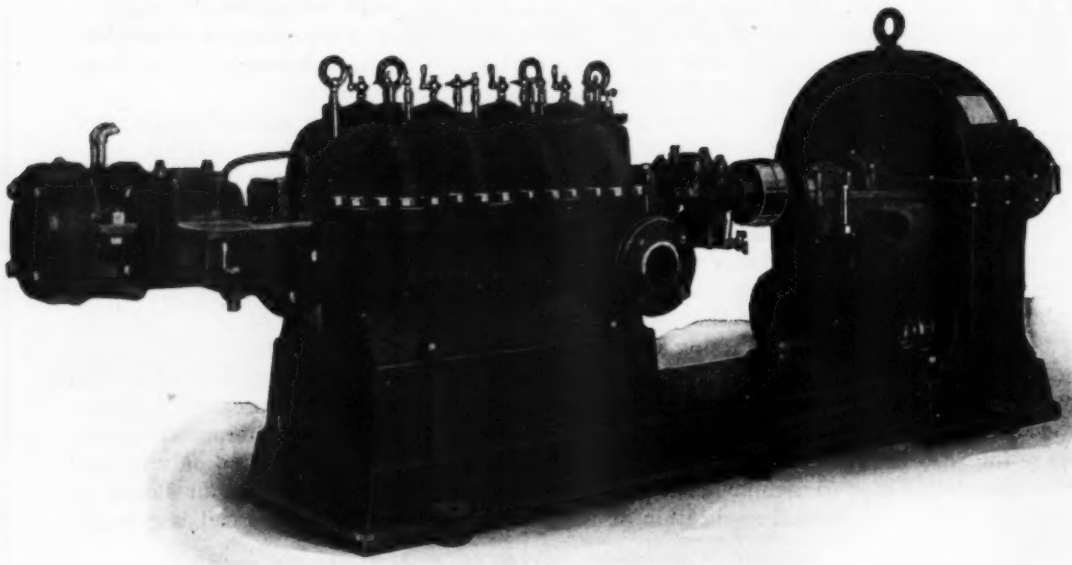
"And so it happens that during the most critical time in the industrial history of the country, when the consumption of commodities has expanded, and world production of commodities has been greatly impaired, we have established a shorter working day, have abolished piece and premium forms of payment, and have imbued the wage earner with the idea that he is entitled to a good living if he but spends eight hours at a job.

"We recognize that there is considerable justice in the demand for an increase among railroad workers, and have no intention of arguing against a fair increase.

"We do think, however, considering the importance of the decision which you are

(Continued on page 533)

Buffalo Class "RDS" Double Suction Impeller Multistage Pumps



4 STAGE CLASS "RDS"—STEAM TURBINE DRIVEN

The ideal unit for Boiler Feed Service, as they operate over a wide range of capacities and boiler horse-powers with very little charge in efficiency.

No Thrust Trouble Is Possible

Water enters each side of each impeller in equal volume and pressure. With this construction all rotating parts are in hydraulic balance at all times and under all conditions.

Built in 2, 3, and 4 stages for capacities up to 2000 G. P. M. and for heads as high as 400 lbs. Suitable for direct connection to moderate speed electric motors or high speed steam turbines or can be furnished for pulley drive. Can be designed for either right or left hand rotation.

Write for Bulletin 952 A.—27

Buffalo Steam Pump Co., Buffalo, N. Y.

Manufacturers of Steam, Power and Centrifugal Pumps and Condensers

New York
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Conveying Abrasive Material

THE greatest copper reclaiming plant in the world is that of the Calumet & Hecla Mining Co., on the shores of Torch Lake, an arm of Lake Superior. Fifty million tons of mill tailings which have accumulated here during the past fifty years are now being dredged and pumped out through the two lines of

Cast Iron Pipe

shown here, at the rate of thousands of tons daily, to tanks in their ammonia leaching plant.

No other pipe has yet been found which so successfully handles crushed ore, sand, gravel, coke, powdered coal, ashes, grain, etc.

Booklet—"Cast Iron Pipe in Industrial Service"—sent on request

The Cast Iron Pipe Publicity Bureau

1 Broadway, New York

Service Measured by Centuries

Sixty-fifth

Service and Quality made these houses possible

1855 — CRANE

MANUFACTURERS OF

Valves
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Anniversary!

These houses made better service possible

CO. —— 1920

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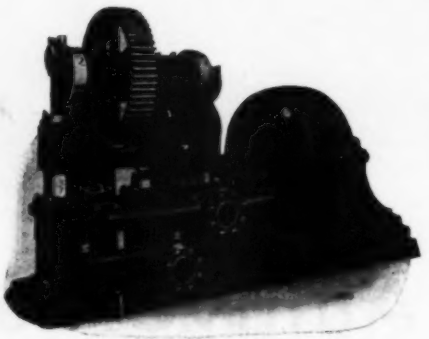
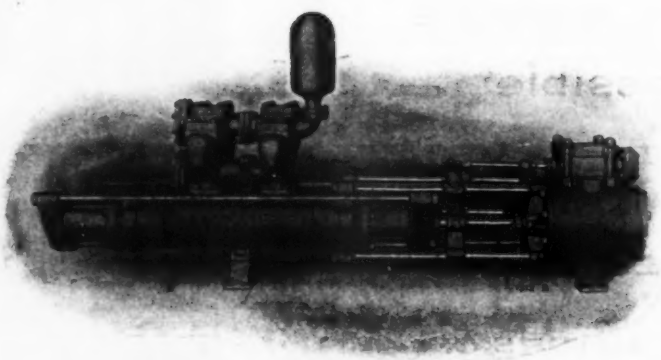


Vertical Triplex Electric Pump

PUMPS FOR ALL PURPOSES



Horizontal "Durable" Duplex Steam Pump

Fifty years of successful manufacturing, devoted exclusively to designing and building pumps, enable the purchaser of Dean Brothers' product to buy the correct pump for the service required

SEND FOR CATALOGUE 127

DEAN BROS.
STEAM PUMP WORKS
INDIANAPOLIS

EDITORIALS

The Cause for H. C. L.

THERE have been many reasons advanced for the high cost of everything that is needed for food, wearing material, and every other article that can be purchased, but most men who have given the subject considerable thought have said that underproduction is the main cause.

Many men have been prone to blame the labor unions for considerable of this trouble, and labor in general, stating that men do not produce what a man usually produced in normal times. This has been said so often that we all believe it. It is refreshing, at least, therefore, to read the address of John H. Donlin, of Chicago, president of the building trades department of the American Federation of Labor, held in Montreal recently.

He stated that "If every worker doing physical labor would insist that production equal to prewar times would again take place there would soon be a very appreciable recession in the prices of all commodities."

Some one has advanced the idea that if we all worked ten hours, instead of eight hours, for the next two years, we would soon be back to normal, and yet it would seem that it is not added hours that we need so much, as it is to fill in the hours we work with honest labor. True, if everyone worked ten hours, and really worked the best they knew how for these ten hours, this would help abundantly.

The president of a large paper manufacturing company told me some time ago that by actual test his men were only doing 59% of a normal day's work, but if these men did 100% of a day's work, then the output of this company's mills would be so much greater, and the larger the output the lower the price will eventually be. And this applies to all commodities.

Let us therefore go to it and do a real hour's work every hour that we get pay for our work, and then old H. C. L. will soon change his tune.

The First Industry

SINCE time began there have been controversies as to which is the oldest industry, and at the same time when such and such an industry was started.

We have decided to settle the question for all time by giving the facts in the case. The paper industry was the first one, and it started thus:

When all of the beasts of the field, the fowls of the air, the fish of the sea, and every other walking, creeping, flying, swimming thing was created, among this motley crowd that was turned loose was the wasp. Now the wasp, differing from some other animals and insects, was brought into being with a desire for a home, and everyone who has ever seen a wasp's home, knows it is made of paper, yes, real paper—not the kind that man uses today, but real paper, nevertheless. In fact, every wasp is born a paper maker. So, on this first day that everything was turned loose and told to go to it, Mr. and Mrs. Wasp immediately started to make paper out of which to build their home. If you do not believe that a wasp's home is made of paper, tear one down and find out for yourself.

Wages and Production

(*Continued from page 527*)

about to render, that you should emphasize the necessity, during these times of extraordinary prices, that part at least, of the increased cost of living shall be met by longer hours of service and increased output, and that piece and premium rates of payment, which during Government operation of the Roads were wholly abolished, should be re-established.

"Third: The industries have for the past eighteen months been adjusting their wage scales to meet the changed conditions. We think your honorable body should be guided in the final determination of wages to be paid, by the rates obtaining in similar crafts in the industries. If the wage scale fixed by your body for the transportation service is above that now current in the industries, it will force another readjustment of wages there, and will be followed by another increase in the price of commodities.

"The industries can quickly adjust themselves to conditions of supply and demand in the labor market, but the scale fixed by your Board will be of a rather permanent character.

"Unless provision is made for readjustment when conditions change, high wage rates and their concomitants, high freight rates, are likely to endure longer than conditions justify.

"Fourth: The advances in cost of living have affected most adversely the lowest paid wage earners, and the increases in the wages paid unskilled labor have, therefore, been largest.

"It is only fair to suggest to your Board, therefore, that no uniform percentage increase in wages be granted, but that the rate of wage increase be greater in the lower paid classes than in the higher.

"This would but repeat what has actually happened in the wage readjustment of the industries."

"BUFLOVAK" EVAPORATORS AND VACUUM DRYERS

If there ever was a time when manufacturers should be especially careful in the selection of their equipment, that time is now. There is only one way to be absolutely sure of the good quality of your equipment and that is to be sure of the organization that builds it.

The world is composed of two classes, those who LEAD and those who FOLLOW. "Buflovak" products have been leaders since they were first introduced. Others have imitated, but no one has duplicated their value.

"Buflovak" Evaporators

are built in all types and for any capacity. We have special types for concentrating black liquor, sulphite waste and other by-products of the pulp and paper industry.

Horizontal and Vertical Tube Evaporators; Rapid Circulation Evaporators; High Concentrators for caustic soda, potash, etc., Leaching Cells, Causticizers, Digesters, Caustic Pots and other apparatus for soda, sulphate and sulphite mills.

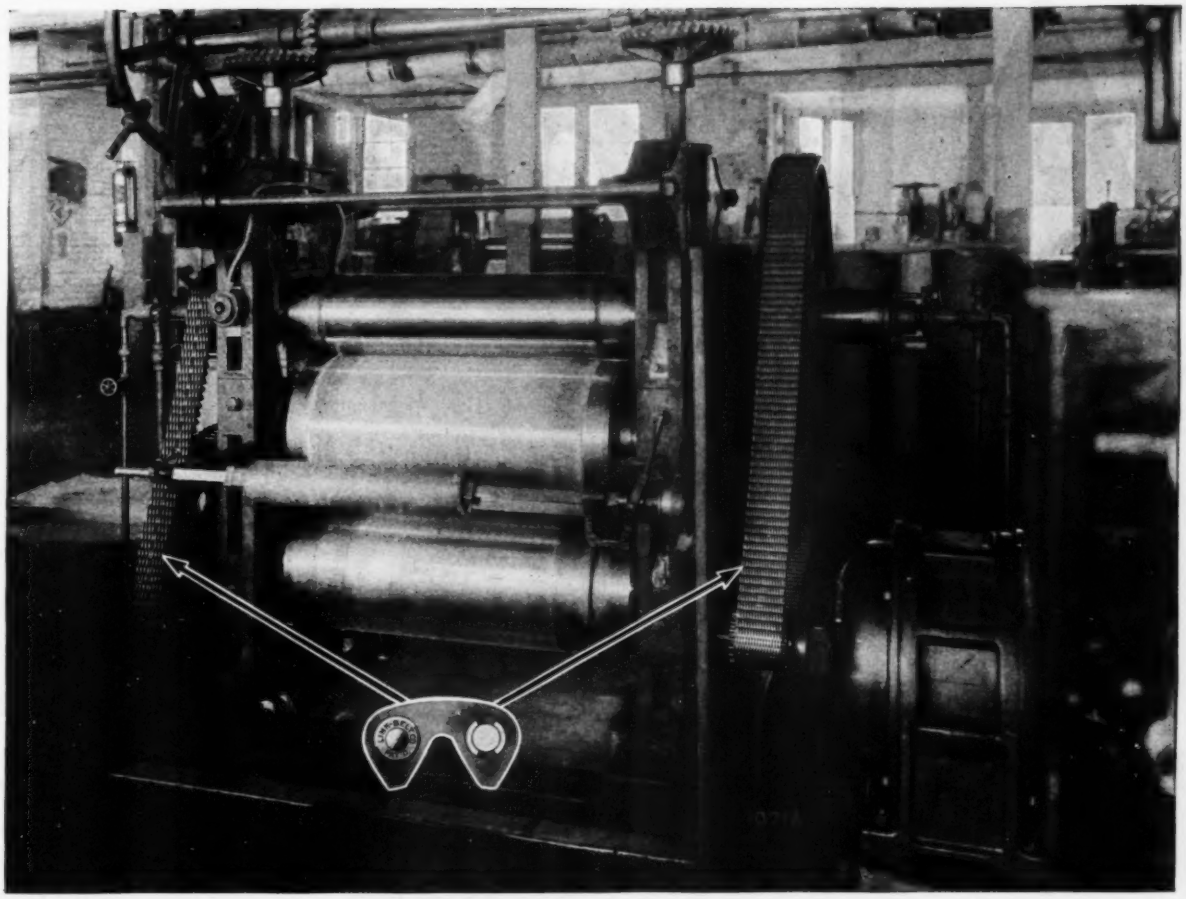
"Buflovak" Vacuum Dryers

Have you ever considered the possibilities of recovering your sulphite waste and converting it into a salable product? This is one of the fields developed through the "Buflovak" Vacuum Drum Dryer, which converts the liquors into a dry, powdered form at low cost. We will gladly tell you about it.

Vacuum Dryers, furnished in all types; Vacuum Pumps, Condensers, etc.

Catalog and Full Information on Request

Buffalo Foundry & Machine Co.
1599 Fillmore Ave., Buffalo, N.Y.
NEW YORK OFFICE 17 BATTERY PLACE



Drive Your Machines with Silent Chain

INCREASE production through efficiency. Don't continue to use slipping flat belt drives on machines from which you expect maximum production. Use a drive that can't slip—the 98.2% efficient Link-Belt Silent Chain Drive, on your machines and lineshafting.

Link-Belt Silent Chain can be run on short centers, at relatively high speeds, and in either direction. It is not affected by heat, cold or moisture, and by actual certified test, under exactly similar conditions, in competition with leather belts and spur gearing, it delivered more power (98.2%) at less cost, to perform useful work.

Link-Belt Silent Chain saves floor space, insures quiet operation of machinery, has long life, reduces journal friction to a minimum, and possesses many other advantages which we shall be glad to point out to those interested.

Write for Link-Belt Silent Chain Price-List Data Book No. 125.

576

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Boston 9 49 Federal St.	49 Federal St.	Detroit 730 Woodward Ave.	Toronto, Can. Canadian Link-Belt Co., Ltd.	
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Wilkes-Barre 2nd Nat'l Bank Bldg.	2nd Nat'l Bank Bldg.	Portland, Ore. First and Stark Sts.	Birmingham, Ala. S. L. Morrow, 720 Brown-Marx Bldg.	
Huntington, W. Va. Robson-Prichard Bldg.	Robson-Prichard Bldg.	San Francisco 582 Market St.	Charlotte, N. C. J. S. Cothran, Com'l Bank Bldg.	

Aladdin

Employees of the American Beet Sugar Co. Get Aladdin Readi-cut Houses

When the housing shortage made itself felt at Rocky Ford, Colorado the American Beet Sugar Company came to the aid of its foremen and high grade employees by providing suitable quarters for them close to their employment.

Aladdin Readi-Cut homes were purchased because of the quality and many other advantages connected therewith. ***Since the initial order for houses was completed additional orders for more Aladdin houses have been received from this customer.*** Many firms will find it advantageous to take similar interest in housing their employees. For obtaining quick service, guaranteed complete delivery, best quality material and all-round satisfaction, bring that housing problem to Aladdin.

When you are ready to consider your housing problem bear these facts in mind.

Aladdin—

—expedites your building project—
—houses your men well and quickly—
—saves 18% of the cost of lumber—
—saves 30% of the labor cost—
—reduces the skilled labor required—
—guarantees complete shipment of material—
—guarantees the quality—
—carries material for 1,000 houses in stock—
—ships from the nearest timber region—

—quotes definite prices on any order from one house up to a city of 3,000, including churches, schools, offices, water and sewage systems, electric plants, street and house lights, heating plants, street parks, trees, lawns, etc., complete.

Write, wire or phone for Aladdin catalog No. 1828

The Aladdin Co.

Offices and Mills at

Bay City, Mich.
Wilmington, N. C.
Hattiesburg, Miss.
Portland, Ore.
Toronto, Ont.

Industrial Housing

How Does Your Plant Impress People Who Pass It?

Railroads, street cars and automobiles carry thousands of people past manufacturing plants every day in the year. If the buildings are well painted and in good repair, those who see them get the impression that the products manufactured within must be good. A dilapidated looking plant gives the opposite impression.

If your buildings need repainting it will be good advertising to brighten them up with

ELASTIKOTE

This is a paint designed especially for use on wood, brick or metal buildings in manufacturing districts. It is different from other paints, because it is made from an elastic gum base instead of a lead and zinc base. This elastic gum is not affected by smoke, gases, moisture or severe weather conditions and imparts these same qualities to the Elastikote. Lead and Zinc Paints are not so satisfactory in manufacturing districts, because they soon darken and disintegrate.

Elastikote has been used for many years by some of the most prominent paper mills in the country —a list of these users will be sent upon request, together with a color card and complete information about Elastikote.

The Tropical Paint & Oil Co.

CLEVELAND, OHIO

Specialists in the Manufacture of Protective and Decorative Coatings for Industrial Plants

ECONOMY FUSES

—were the first line using an inexpensive bare link for restoring a blown fuse to its original efficiency to be *approved in all capacities* by the Underwriters' Laboratories.

When you order fuses insist on ECONOMY.

For sale by all leading electrical jobbers and dealers.

ECONOMY FUSE & MFG. CO.
CHICAGO, U. S. A.

Economy Fuses also are made in Canada at Montreal

All Capacities **— 0 to 600 amperes in both 250 and 600 volts bear the "Inspected" labels.**

Dodge Standard Split Pulley

A CAST IRON PULLEY SOLD FROM STOCK

with Interchangeable Split Bushings

TRUE IN BALANCE

Here is the only metallic pulley that will maintain a perfect balance under all conditions.

The Standard Split Pulley will grip the shaft without the necessity of keyways; it will last forever in service because of the total absence of rivets or other parts to crystallize or wear off.

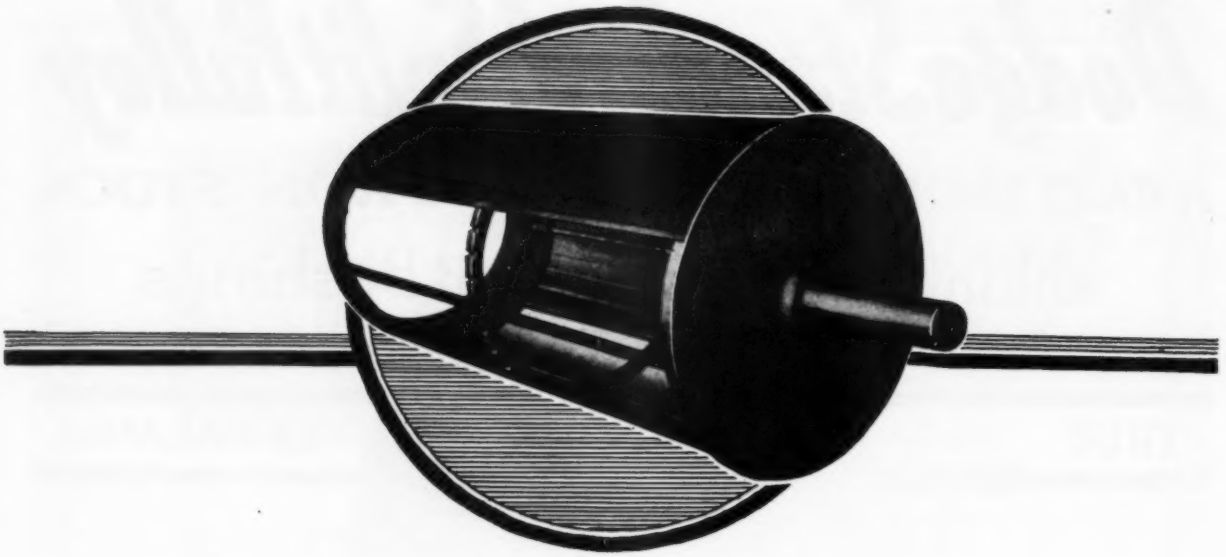
Buy this pulley from your dealer's stock; the interchangeable metallic bushing system permits its use upon any size of shaft within its range of bore.

DODGE

Dodge Sales & Engineering Company, distributor of the products of the Dodge Manufacturing Company and the Dodge Steel Pulley Corporation. General Offices: Mishawaka, Ind. Works: Mishawaka, Ind., and Oneida, N. Y.

Canadian Plant: Dodge Mfg. Co. of Canada Ltd., Toronto and Montreal

Philadelphia Cincinnati New York Chicago St. Louis Boston Atlanta Pittsburgh Minneapolis Dallas Providence Seattle Newark



facts —which account for the widespread indorsement of Bird Inward Flow Rotary Screens.

better paper— Because the screen plates cannot foul and because they are constantly subjected to the action of a shower—lumps, string and slime do not collect. Uniformly clean paper is thereby assured.

more production— Bothersome delays with their resulting production loss—made necessary by continued washing-up, and paper breaks due to dirty screens—are eliminated.

time and trouble saved— Bird Screens are self-cleaning. Attention of screen boys and machine tenders not needed.

saves power— The Bird Rotary Screen uses **less than half** of the power of the old type screen of the same capacity.

Bird Screens are made in different sizes—for all grades of paper. They fill a long-felt need for a large-capacity, long-service rotary screen.

Catalog 1F shows you how you can get—in **your** mill—cleaner paper—more of it—all the time—at the lowest cost per ton per hour. Write for it.

BIRD MACHINE COMPANY

EAST WALPOLE, MASS.

T. H. Savery, Jr., Western Representative:
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Canadian Builders of Bird Machinery:
Canadian Ingersoll-Rand Co., Ltd.,
260 St. James Street, Montreal, Can.

SIZING

The Most Important Chemical Process in the Paper Mill

TO argue against the merits of the DeCew Sizing System is to argue against the advantages and benefits of present day improvement.

When necessity compels, we *can* get along without the telephone, the internal combustion engine, the steam vessel. But to voluntarily accept older substitutes when science, skill and experience present the

DE CEW SIZING SYSTEM

is a matter of needless deprivation.

Already 56 mills are enjoying the advantages offered through the DeCew System. This recognition was not a matter of chance or haphazard decision—

Among the many advantages may be mentioned:

Improved quality of paper. Uniformity of Product.
Greater resistance to destructive action of heat and light.
Use of less alum. Conservation of rosin.

PROCESS ENGINEERS · *Inc.*

501 Fifth Ave. New York 903 McGill Bldg. Montreal

MUNISING PAPER COMPANY

MUNISING MICHIGAN

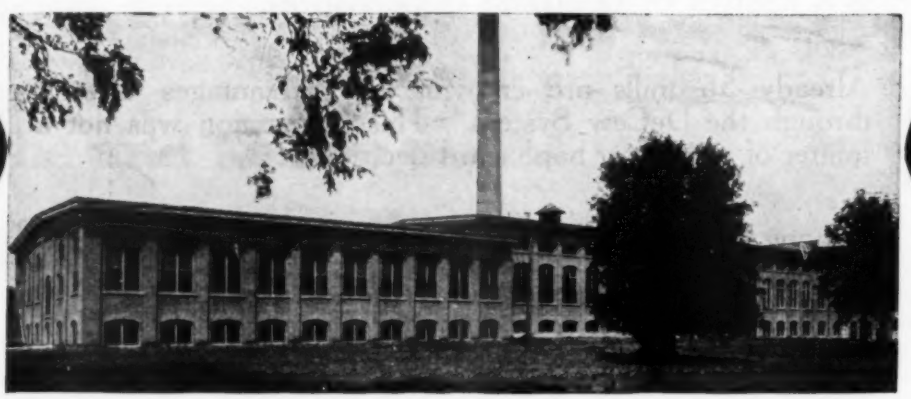
MANUFACTURERS OF

MUNISING M BOND

COLOR QUALITY AND UNIFORMITY
HAVE MADE FOR IT
AN ENVIABLE REPUTATION

P L Co.

The Symbol of Quality



P L Co.

The Symbol of Quality

LAKESIDE PAPER COMPANY

NEENAH, WISCONSIN

Quality and Service

MANUFACTURERS OF

LIGHT WEIGHT SPECIALTIES

THE PRODUCTS OF INDIVIDUALITY

The chief requisite of every Manufacturer or Consumer of Paper Board is to acquire the services of an energetic selling organization.

Our Company
Vibrates
With Energy

STREHL OTENS
COMPANY, INC.

Paper Boards and Specialties

FIFTH AVENUE BUILDING
NEW YORK

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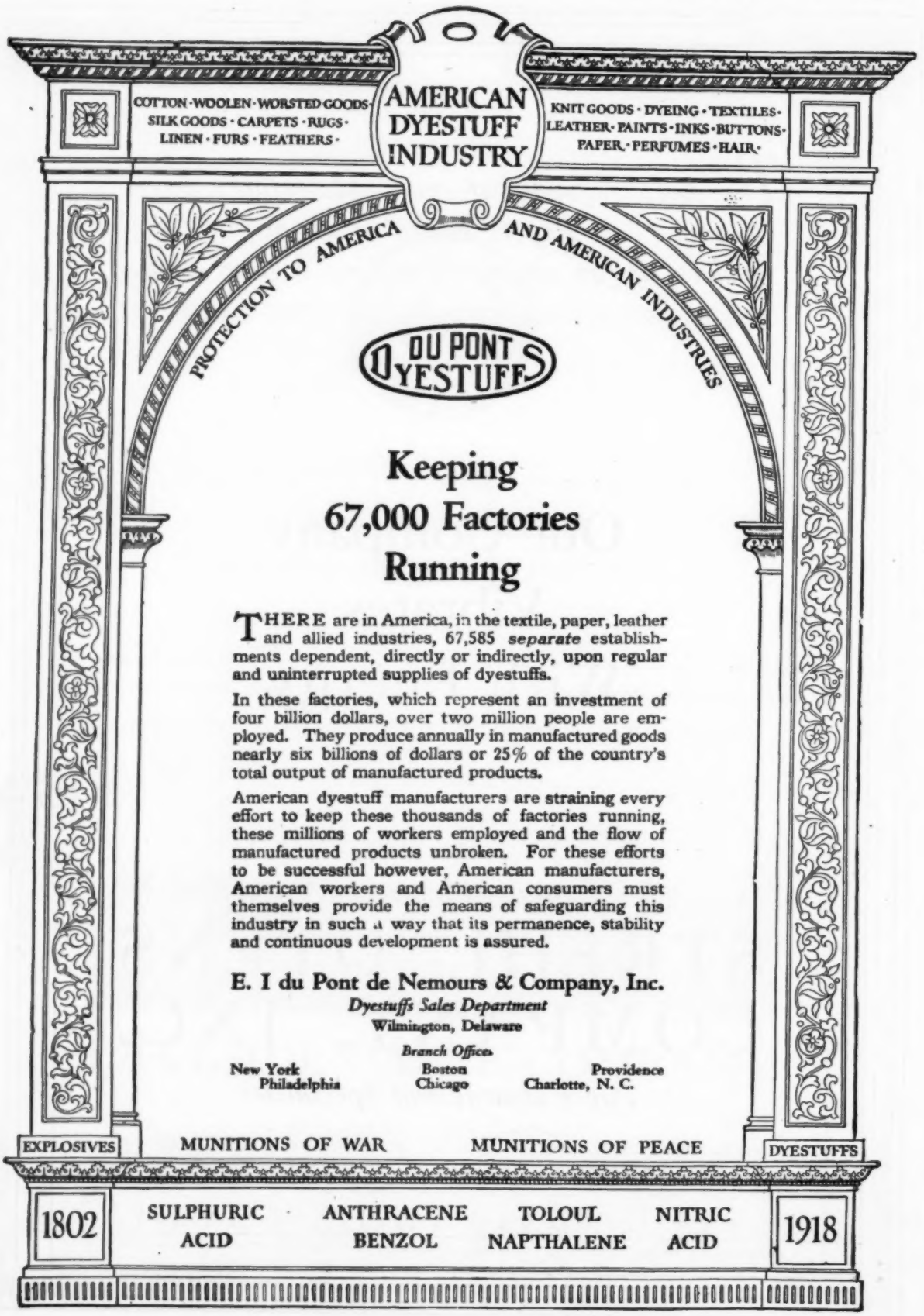
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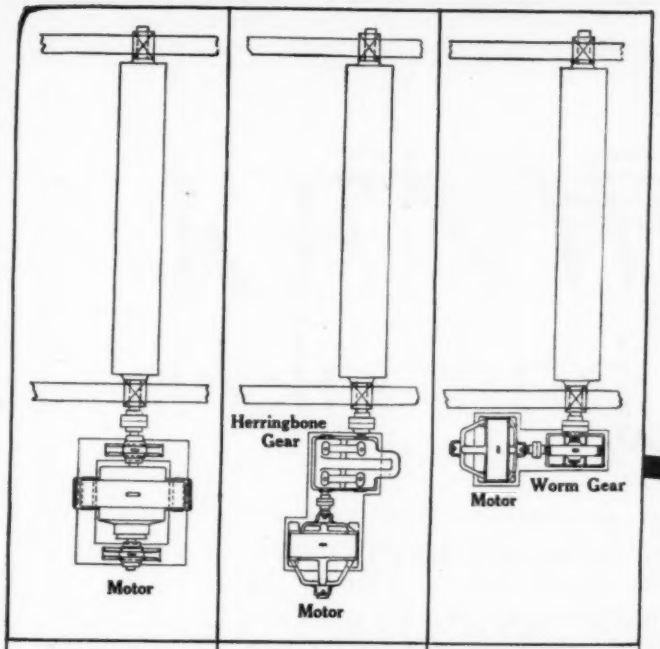

Slow Speed Motor Direct connected to 164" High Speed News Machine	Medium Speed Motor connected to 164" High Speed News Machines Through Herringbone Gear	Medium Speed Motor connected to 164" Slow Speed Cylinder Board Machine Through Worm Gear

Sectional Individual Motor Drive

that meets Every Requirement of Paper Machines

These views show actual floor space required

Although the same principles are involved in driving high speed news machines, medium speed book or specialty machines and slow speed cylinder board machines, the mechanical arrangement of the drive is often necessarily determined by the space available for its installation.

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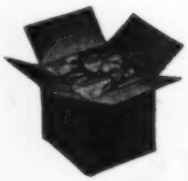

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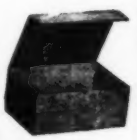

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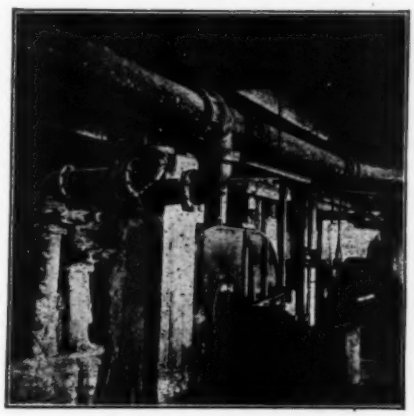

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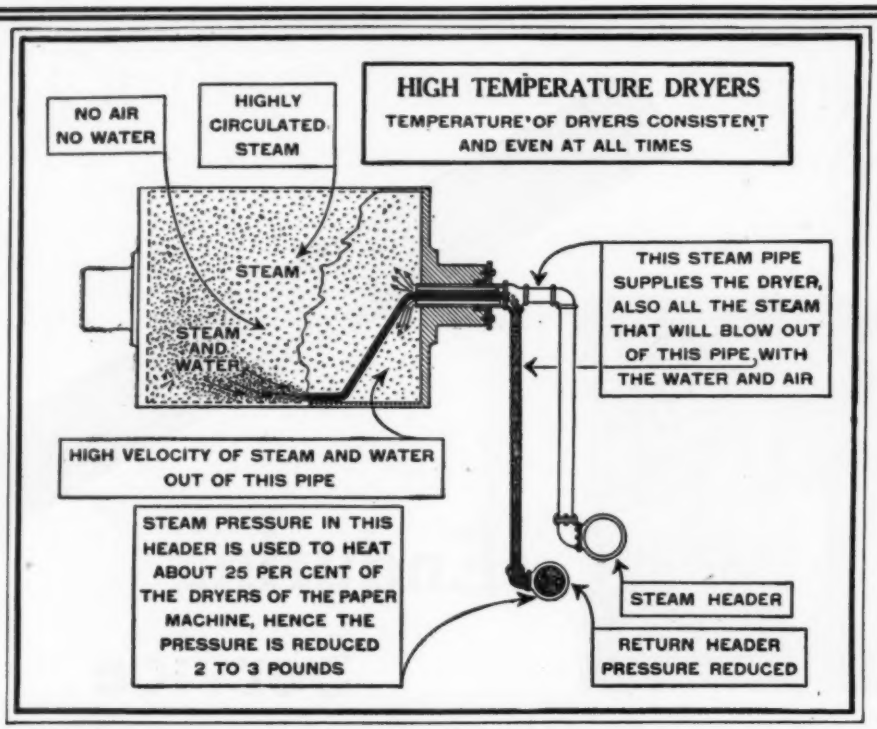
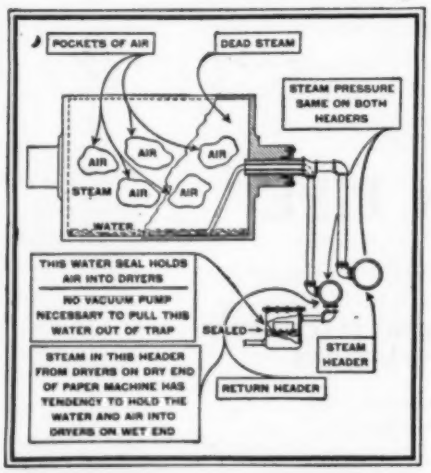
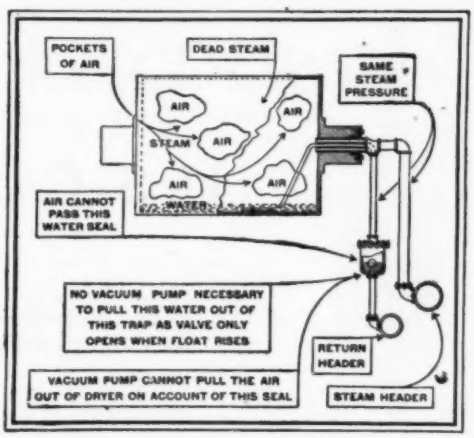

NO AIR
NO WATER
HIGHLY CIRCULATED STEAM
HIGH TEMPERATURE DRYERS
TEMPERATURE OF DRYERS CONSISTENT AND EVEN AT ALL TIMES
STEAM
STEAM AND WATER
THIS STEAM PIPE SUPPLIES THE DRYER, ALSO ALL THE STEAM THAT WILL BLOW OUT OF THIS PIPE WITH THE WATER AND AIR
HIGH VELOCITY OF STEAM AND WATER OUT OF THIS PIPE
STEAM PRESSURE IN THIS HEADER IS USED TO HEAT ABOUT 25 PER CENT OF THE DRYERS OF THE PAPER MACHINE, HENCE THE PRESSURE IS REDUCED 2 TO 3 POUNDS
STEAM HEADER
RETURN HEADER PRESSURE REDUCED

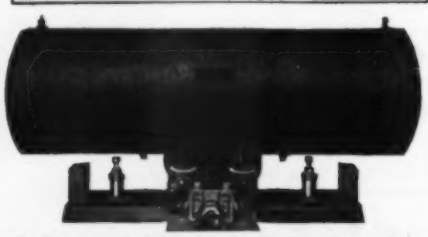
Farnsworth System Provides 100% Drying Capacity

by forcing the water and pockets of air out of the dryers. It is impossible to pull or suck air and high temperature water out of the dryers.


POCKETS OF AIR
DEAD STEAM
STEAM PRESSURE SAME ON BOTH HEADERS
AIR
STEAM
WATER
THIS WATER SEAL HOLDS AIR INTO DRYERS
NO VACUUM PUMP NECESSARY TO PULL THIS WATER OUT OF TRAP
SEALED
STEAM HEADER
RETURN HEADER
STEAM IN THIS HEADER FROM DRYERS ON DRY END OF PAPER MACHINE HAS TENDENCY TO HOLD THE WATER AND AIR INTO DRYERS ON WET END

The Farnsworth Forced Steam Circulation System secures results—we stand back of every installation and guarantee satisfaction.


POCKETS OF AIR
DEAD STEAM
SAME STEAM PRESSURE
AIR
STEAM
WATER
AIR CANNOT PASS THIS WATER SEAL
NO VACUUM PUMP NECESSARY TO PULL THIS WATER OUT OF THIS TRAP AS VALVE ONLY OPENS WHEN FLOAT RISES
RETURN HEADER
VACUUM PUMP CANNOT PULL THE AIR OUT OF DRYER ON ACCOUNT OF THIS SEAL
STEAM HEADER



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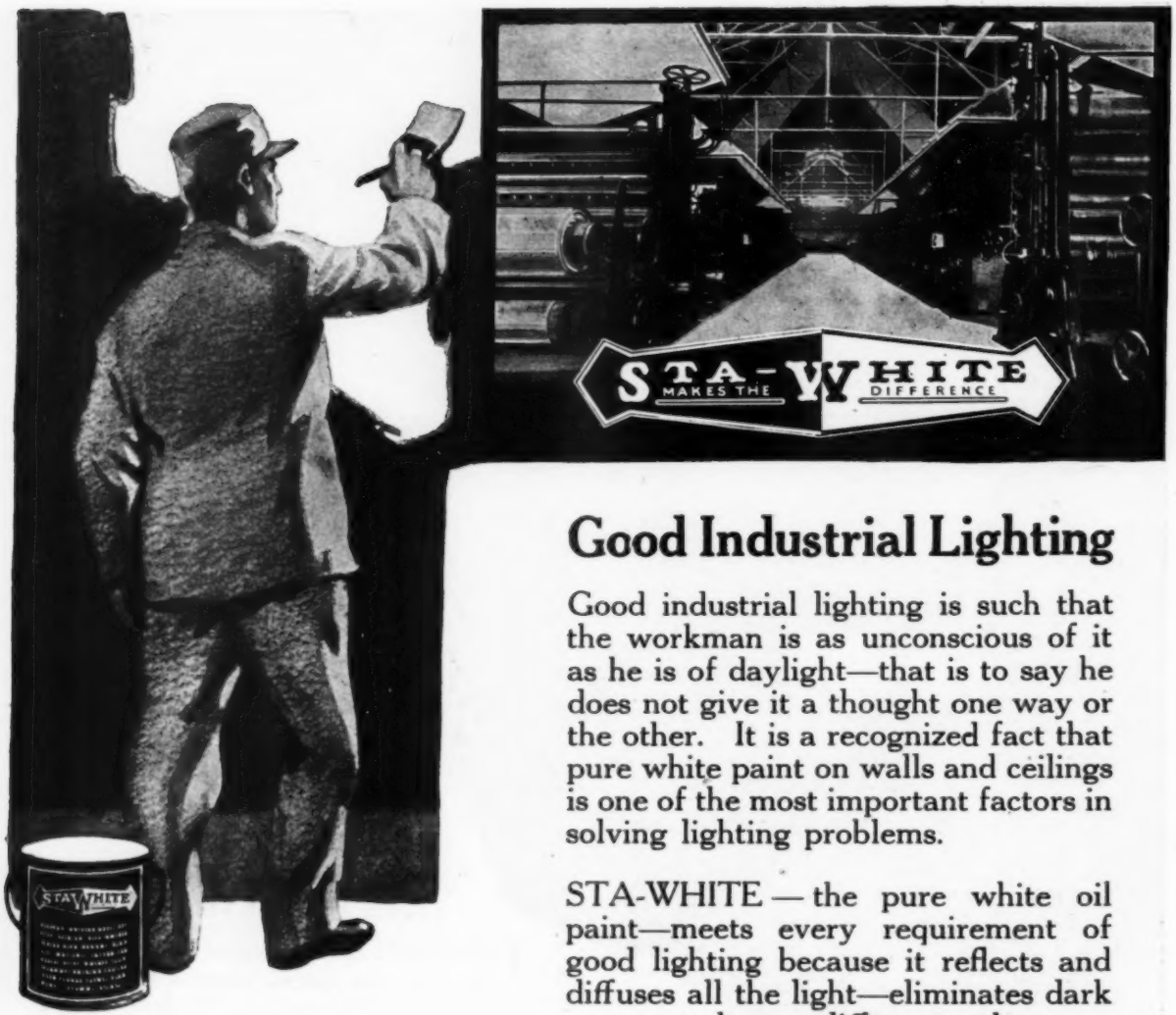

Good Industrial Lighting

Good industrial lighting is such that the workman is as unconscious of it as he is of daylight—that is to say he does not give it a thought one way or the other. It is a recognized fact that pure white paint on walls and ceilings is one of the most important factors in solving lighting problems.

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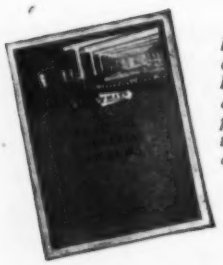

It will pay you to read our book, "Lighting Industrial Interiors." It discusses the lighting problem from a practical point of view. A copy on request.

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Automatic Regulation of Relative Humidity

Conditioning Apparatus Developed at U. S. Forest Products Laboratory at Madison, Wisconsin

By A. C. KNAUSS
Assistant Engineer in Forest Products

IT has long been known that atmospheric conditions has been an important factor in many lines of industrial work, and in experimental and research work the influence of such conditions has been felt even more. It has become necessary in many research problems to control atmospheric conditions to exact values in order to secure reliable and comparative results. The influence of the moisture in the air upon chemical reactions and physical properties has often been found to be as important as the influence of temperature itself.

In industrial plants, the control of relative humidity has been found necessary to make possible the manufacture of certain goods. Some goods require very low relative humidities, during manufacture, others very high relative humidities, while some again require uniform moderate relative humidities. In the wood-working industry, the influence of changing atmospheric conditions is seen in the swelling or shrinkage of lumber with gain or loss of moisture. Where wood parts have been cut to size, and it is necessary to prevent warping or change in size, the relative humidity must be controlled in the shops where such wood parts are kept and worked.

Because of such conditions, apparatus described in this article was developed to facilitate an investigation of the manufacture and service of airplane propellers. The principles of control had been used by Mr. H. D. Tiemann, M. E., M. F., in the development of the water spray dry kiln. Modifications of the dry kiln arrangement permitted the application of these principles to the control of atmospheric conditions in wood storage and wood working rooms. Its successful operation has extended its field of application to such an extent that it can be used in practically any place requiring control, and particularly where close control is required.

In paper-testing laboratories, where uniform, controlled relative humidities are necessary to make tests on paper, this method of control should be of particular value because of its automatic operation.

Kinds of Conditioning Apparatus

Conditioning devices may be divided into three classes. There is the non-controlled type, in which water is sprinkled on the floor from cans; wet sawdust is sprinkled on the floor, wet wicks are hung around the room, or water is allowed to run in open troughs around the room. There is the semi-controlled type which is capable of giving moisture, but not of extracting excess moisture from the air. Many of the cheaper commercial types are of this class. In these, the apparatus sprays moisture in some form into the air until the relative humidity has been brought to the desired point, upon which the apparatus stops. If conditions become such that the relative humidity is greater than that desired, the apparatus remains inactive until the relative humidity is decreased by outside influence below the point of operation.

The absolutely controlled type includes devices which are capable of keeping the relative humidity constant, increasing it when natural conditions bring it too low and decreasing it when conditions bring it too high. The automatic conditioning apparatus described in this article belong to this last class.

Relative Humidity

The maximum amount of water that space can retain at any given temperature and pressure is fixed. The presence of air does not affect the presence of water vapor, and relative humidity is commonly expressed as referring to the moisture retained by the air. If the temperature of the air is increased, its capacity to retain moisture is increased, while if it is cooled, the capacity is decreased and condensation occurs. When air retains its maximum capacity of water vapor, it is said to be saturated.

Relative humidity is the ratio, expressed in percentage, of the amount of moisture present in the air compared to the amount of moisture required for saturation at the same temperature.

Since it is possible to increase the capacity of air to retain moisture by increasing its temperature, we can reduce the relative humidity by increasing its temperature without addition of moisture. This is what ordinarily happens in cold climates. Air is drawn into buildings from outside, is heated without moisture being added, and very low relative humidities result. In warmer climates, excessively high temperatures would result from such a method of

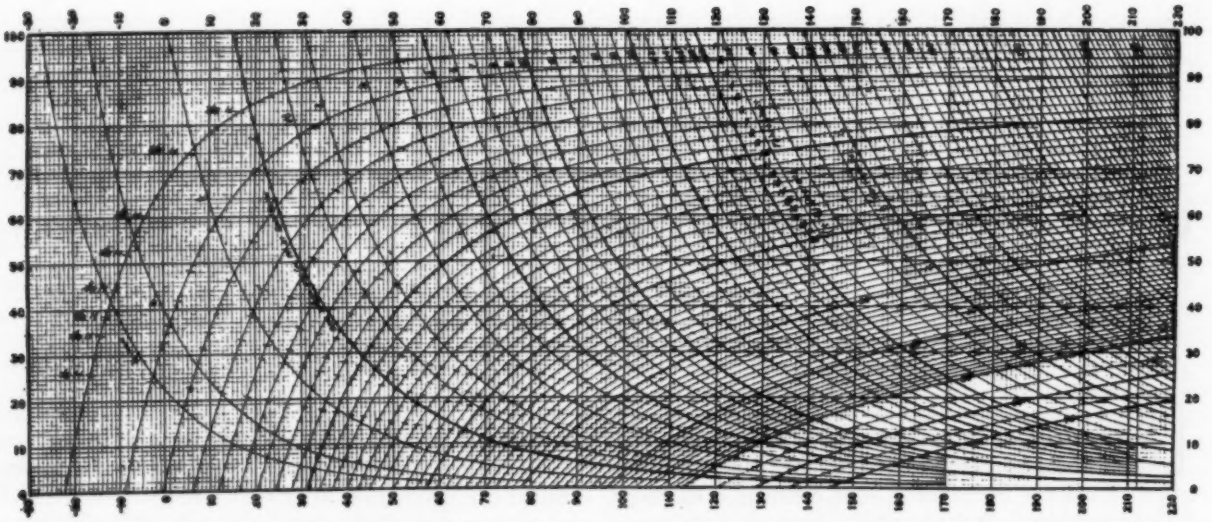


Fig. 1. Humidity Diagram for Determination of Absolute Humidities, Dew Points and Vapor Pressures; Also Relative Humidities by Means of Wet and Dry Bulb Thermometer, for Any Temperature and Change in Temperature

lowering the relative humidity, making it impossible for workmen to carry on operations.

If we increase the temperature of air from 60° F. to 80° F., we have doubled its capacity to retain moisture. It is evident then that we can saturate air at 60° F., heat it, without adding moisture, to 80° F., and have the air retaining but one-half its moisture capacity. Its relative humidity will then be 50 per cent. On the other hand, if we saturate the air at 48° F. and heat it, without adding moisture, to a temperature of 80° F., we have trebled the moisture capacity, and the relative humidity now becomes 33 per cent. Evidently we can secure any desirable relative humidity at 80° F. by choosing the proper temperature, at which the air must first be saturated. This is also true for any other temperature, and in order to control the relative humidity of a room to certain conditions, we must determine the saturation or dewpoint temperature for the desired condition, cool and saturate the air at such temperature, and then heat the saturated air without addition of moisture to the room temperature required.

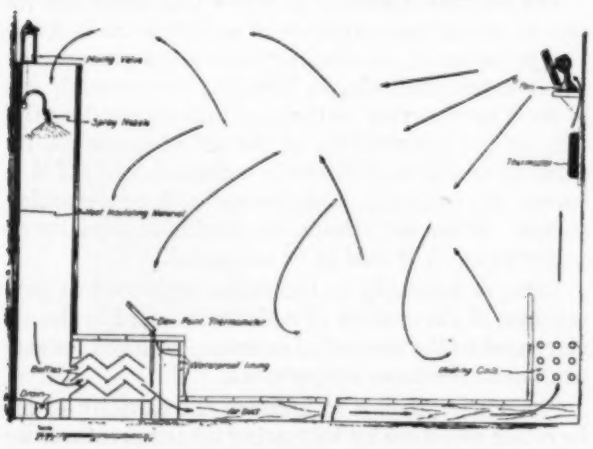


Fig. 2. Arrangement of Humidity Control Apparatus

Figure 1 shows a curve from which the dewpoint temperature for any room conditions may be determined. The scale at the bottom gives room temperature in degrees Fahrenheit, while the scale at the left gives relative humidity values. The dewpoint temperature is determined by passing through the point of intersection of the horizontal line, designating the desired relative humidity, and the vertical line, designating the desired room temperature, a line parallel to the curved lines rising toward the left. The temperature at which this curved line intersects the top of the sheet (100 per cent relative humidity) is the dewpoint temperature of the room condition desired. If we wish to control the air in a room to 90° F. and 65 per cent relative humidity, we find the

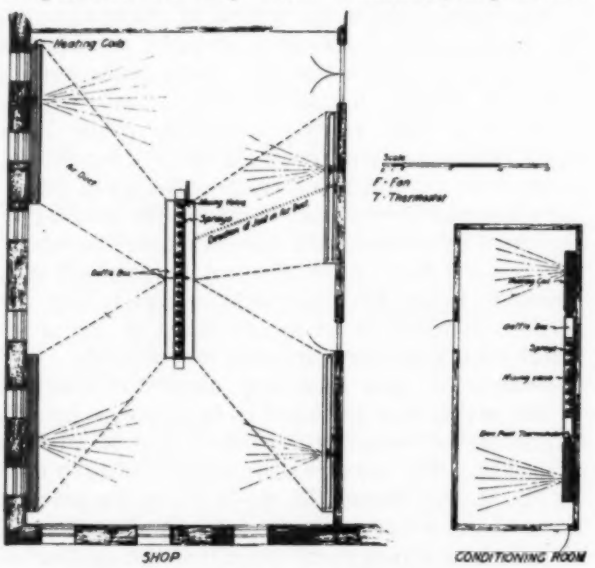


Fig. 3. Plan of Shop and Conditioning Room

intersection of the line representing 65 per cent relative humidity and the line representing 90° F. at A. A heavy curved line passes through this point and upward toward the left, intersecting the top of the sheet at 77° F., the dewpoint temperature for a room

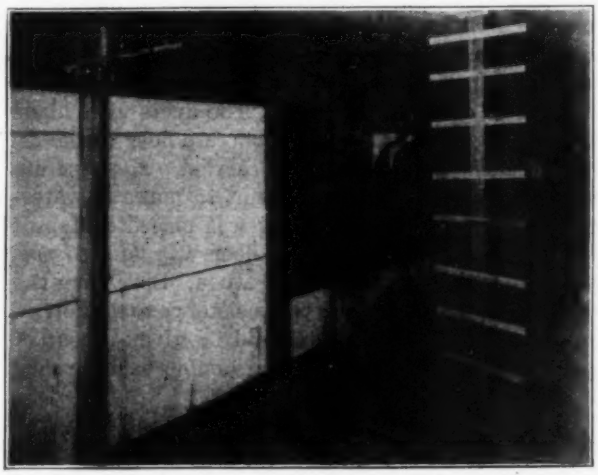


Fig. 4. One-half of the Metal Spray Chamber, Mixing Valve Shown at the Upper Left

condition of 90° F. and 65 per cent relative humidity. If the relative humidity is to be 50 per cent at 90° F. we find point B and the dewpoint temperature is 69° F.

Dewpoint Control

The apparatus for controlling atmospheric conditions consists of two units, one for the control of the dewpoint, and another for the control of the room temperature.

The dewpoint is controlled by passing the air through a water spray curtain, which cools the air to the desired dewpoint temperature, and at the same time saturates it. A spray chamber, made of waterproof material, preferably non-rusting metal, is built with a series of spray nozzles placed at one foot intervals near the top. These nozzles are supplied from a mixing valve, which, fed with hot and cold water at the same pressure, furnishes water at any intermediate temperature. Water is fed to the nozzles at a pressure of about 40 pounds, producing a fine spray which creates a suction, and draws the air downward with it. At the same time the air is cooled and saturated. Upon reaching the bottom of the chamber, the spray water drains off, and the air passes out through baffles, equipped with sharp lips to remove all entrained moisture from the air. A thermometer is placed in the path of the air as it leaves the baffles, and the dewpoint temperature is measured here. Beyond this point, no further cooling nor change in moisture occurs. The mixing valve is adjusted until the dewpoint thermometer is brought to the desired reading and the effect of heat losses in the apparatus is eliminated. Where the spray water is much cooler than the room, a covering of insulating material over the spray chamber provides more efficient control.

The lateral depth of the spray chamber is kept small enough to prevent back currents of air, which might carry a mist out into the room. The baffles are made large enough to give open passage for the air to pass through.

After leaving the baffles, the air is carried through ducts to heating coils. The temperature in this duct must be above the temperature of the air entering it, to prevent cooling of the air and condensation of moisture. Absorption of moisture must also be prevented by lining the duct with paint and waterproof paper. If moisture is allowed by or condensed out of the air while passing through this duct control is lost.

Temperature Control

After leaving the duct, the air passes through heating coils, whose steam supply is controlled by thermostats. The thermostat is placed about three or four feet directly above the coils in the path of the rising air. The thermostat operates on the steam supply, allowing just enough steam to enter to bring the temperature of the conditioned air to the desired value. When the temperature rises above that value the steam supply is cut off. In this way the temperature of the room may be closely controlled to a uniform condition, with a variation of one to two degrees. The thermostat can be set for any temperature within

Fig. 5. Wooden Spray Chamber Lined with Waterproof Paper. Front Removed

practical ranges, making it possible to change room conditions when desirable.

Seasonable changes will affect the radiation of heat through the walls, altering the heating requirements.

Breaking up the heating units into subunits permits shutting off several subunits in warmer weather, and close control of temperature is still retained.

Circulation

The conditioned air is circulated by the action of the sprays, which forces the air through the spray chamber and ducts, and by fans placed in the room itself. The circulating effect of the sprays is comparatively small, and while it is enough to pass the air through the spray chamber and ducts, it will not

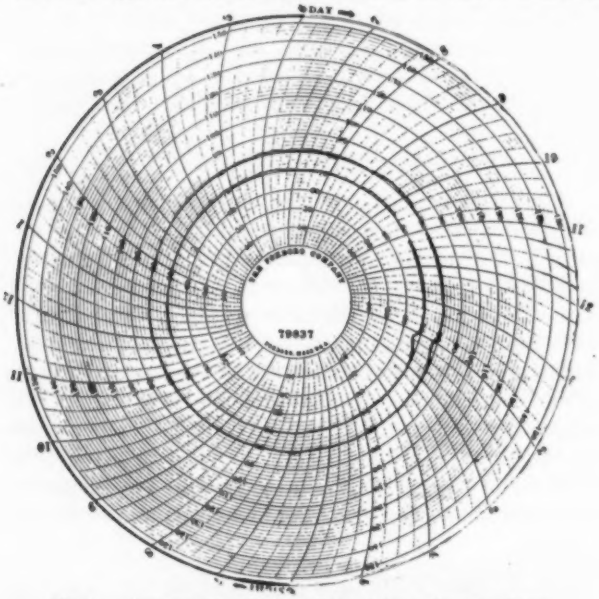


Fig. 6. Autographic 24-Hour Record for a Storage Room

circulate the air through the room. Power fans are necessary to send the conditioned air to all parts of the room.

Air may be drawn into the spray chamber from two sources — from the room itself and from outdoors. Where the rooms are to be used for the conditioning of material, the air can be recirculated almost entirely. Fresh air will be needed only to prevent a stagnant condition. The air in such rooms needs to be recirculated often enough to keep atmospheric conditions under control. If the material does not alter the conditions seriously, recirculation may be carried on at a slow rate and a large conditioning apparatus is not necessary.

In workshops, it is necessary to draw in a generous supply of fresh air for workmen. Doors and windows also are frequently opened and atmospheric conditions are changed. In such rooms, it is necessary to install a much larger conditioning apparatus to keep conditions under control.

Arrangement of Apparatus

Figure 2 shows a cross sectional view of the spray chamber, air duct and heating units. The parts of the apparatus are named and the path of the air is shown by arrows. Figure 3 shows a plan view of a shop room equipped with such apparatus. A similar view of a conditioning room is also shown.

In the shop room, air is drawn in at the top of the spray chamber from the room. A large conductor pipe leads from outdoors into the spray chamber, allowing fresh air to enter. In this way the fresh air is conditioned before entering the room. The spray chamber is placed in the center of the room, and the air ducts are carried under the floor to the heating units along the walls. The ducts were made by running stringers on the concrete floor in the direction in which air was to be carried. The concrete was given several coats of paint to make it waterproof, and a waterproof paper was placed on top of the stringer before the wood floor was laid, to prevent the moisture entering the wood. Spreading the ducts fan shape decreases the resistance to air flow.

The walls of the room should be given a coat of paint, and windows should be double sash in cold weather.

In storage rooms, all equipment can well be placed in one unit along one wall. Figure 4 shows half of such an arrangement. The spray chamber is made of metal and is not covered with a heat insulating material, because the difference between room temperature and dewpoint temperature in this case was only 2.5 degrees. The baffles are placed at one end, and the air is drawn through to the heating coils enclosed in a wooden box. The thermostat is placed on the wall and several feet above the opening, through which the heated air rises. The mixture valve can be seen above the spray chamber with hot and cold water supply. The dewpoint thermometer is seen just above the baffle box, at the end of the baffles.

Figure 5 shows a wooden spray chamber with the front removed. The inside of the chamber is lined with waterproof paper. The sprays are in operation, and it should be noticed that the nozzles are set to give a fine spray and not a mist. The water is passed through goose necks to prevent grit from getting into the nozzles.

Design of Apparatus

The walls of rooms which are to be kept in conditioned influence the design of the apparatus to a great extent. The walls should be made as waterproof as possible and should radiate but little heat to give most efficient operation. Painting the walls goes far toward preventing moisture from passing through them. The walls of small conditioning rooms may be made with dead air spaces and lined with insulating material to prevent radiation of heat.

The number of spray nozzles required depends on the frequency with which the air must be recirculated. Tests have shown that one spray nozzle will move approximately 80 cubic feet per minute through comparatively open passages. In shop-rooms, where a complete change of air should be made every 10 minutes, one spray nozzle will be re-

quired for every 800 cubic feet of space in the room. The rest of the apparatus is designed to conform to the number of sprays.

Spray nozzles operating under 40-pound water pressure pass about 3 pounds of water per minute. Water must be supplied to both sides of the mixing valve at the same pressure in order to mix in proper proportions.

The heating coils must be designed with a capacity to heat the cooled, conditioned air to room temperature, and to compensate for heat radiation through the walls. The heat required to raise the temperature of the air as it leaves the baffles is small. Under ordinary conditions, this increase in temperature is about 20° F., with greater increases as lower humidities are required. The greatest factor in caculating heating capacity is the radiation through the room walls.

Fans are placed in rooms where they will draw the conditioned air from the heating coils, and send it to all parts of the room, leaving no dead corners.

Operation

The particular advantage of the apparatus described in this article is that it will act as a humidifier, or as a dehumidifier, as occasion demands. If the air entering the spray chamber is dry, moisture is taken up from the spray water, and if the air is too damp the excess moisture is condensed out when the air is cooled to the dewpoint temperature. Without any adjustment of the apparatus, the conditions are automatically brought back to the values the instruments are set to. Whether moisture and heat leave or enter through the walls, doors or windows, or whether the material brought into the room gives off or absorbs heat and moisture, the conditioning apparatus is automatic in its operation, and the desired conditions are promptly brought back.

Figure 6 shows an autographic record of a 24-hour period in a storage room controlled by this water spray conditioning apparatus. The room is 12 feet by 30 feet by 8 feet high. and is well insulated. The outer curve is the dry bulb reading and the inner curve the wet bulb reading of a hygrometer.

The care required for the apparatus is nominal. Where the installation is of metal and parts are of non-rusting material, occasional cleaning of spray nozzles and adjustment of mixing valves and thermostats is all that is required. The water supply should be free from scum, grit and dirt to prevent clogging of sprays.

Under normal conditions the operation of this apparatus should give no trouble and should prove satisfactory, and particularly efficient where close control is necessary. For the conditioning work, of which it is capable of performing, the cost of installation is moderate and the cost of operation is confined almost entirely to that of water supply.

As a means of controlling conditions in an experimental plant on propeller work. this installation has tion to commercial investigation and industry is proved entirely satisfactory, and its future applicapromising.

The Selection and Testing of Alum for Papermaking

By E. G. MILHAM, Chem. Engr.
Bryant Paper Co.

In view of the present condition of the chemical market in general, and the alum market in particular, the following article is written with the belief that a few notes suggesting economies in the use of this material will not be out of place at this time.

AS ALL papermakers know, "alum" or, to be more exact, sulfate of aluminum, is used to precipitate the rosin soap size onto the stuff in the beater, to act as a mordant for colors, and as a foam preventative. It will be noted that the word "alum," above, is placed in quotation marks. This is done because the word is a mis-nomer. Strictly speaking, alum is a crystallized double sulfate composed of two metals, sulfuric acid, and combined water. As an example of a true alum, we have $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24\ H_2O$, known as POTASH ALUM, which is made up of sulfate of potash, sulfate of alumina, and water. As another example, we have FERRIC ALUM, $(NH_4)_2SO_4 \cdot Fe_2(SO_4)_3 \cdot 24\ H_2O$.), which is made up of sulfate of ammonia, sulfate of iron, and water. It will be noted that the latter alum contains no aluminum whatsoever; but does contain a very large proportion of iron, which would raise no end of havoc if brought into the beater.

This point about alum being mis-nomer is one which papermakers should keep well in mind, because serious mistakes are often made as a result of misunderstanding on this account. Therefore, in speaking with out-siders, it is always best for papermakers to forget the word "alum" and use the more correct term "sulfate of aluminum." However, around the mill, the word "alum," though technically incorrect, serves very nicely, and throughout this

article, it will be used in place of the longer term "sulfate of aluminum."

Chemistry of Alum as a Size Precipitant

The action of alum and rosin size in the beater is a rather difficult matter to explain. This is made doubly difficult by the fact that there is a considerable difference of opinion among chemists, size makers, and mill men, in regard to this very matter. However, the view of the writer (which incidentally, has been supported by a large number of experiments) is as follows: Rosin soap is not a true chemical compound of rosin and soda, but, rather, is a very loose combination of these two materials. At any rate, the soda in a rosin size emulsion is able to function the same as though the rosin were not present at all. Now, when sulfate of alumina is brought into contact with the soda of the rosin size, a new compound is formed according to the following equation:

$Al_2(SO_4)_3$	plus	$6NaOH$	GIVES	$3NA_2SO_4$	plus	$2A1(OH)_3$
Sulfate of aluminum	"	Caustic Soda	"	Sodium sulfate	"	Aluminum-hydroxide.

This new compound, aluminum hydroxide, is an insoluble, rather fluffy material which remains insoluble even though sufficient excess alum be added to make the mixture distinctly acid to litmus paper. If the individual particles of this aluminum hydroxide were sufficiently magnified, they would look something like feathers, or perhaps small sponges; while, if the individual particles of rosin size milk were magnified to the same degree, they would look like atoms of dust. With this in mind, it is easy to see how the large particles of aluminum hydroxide ($Al(OH)_3$) gather up the small particles of rosin size, much as a mother hen would gather her chicks under her wing. Of course, while the rosin size is being deposited on the fibres in the beater as described above, other actions, which might be worthy of mentioning, are also taking place. First, there is a mutual attraction between the aluminum hydroxide and the rosin size, much as there is between the hen and chicks mentioned above. In addition to this, the excess alum (which is always present in the beater) as well as the sodium sulfate, formed as shown in the above equation, have a coagulating action on the size, which helps greatly toward precipitating it onto the stock. In fact, several chemists and size makers have declared that this coagulating action was the only function performed by the alum in precipitating rosin size. If this were true, practically any electrolyte, such as sodium sulfate, calcium chloride, or common salt, could be used to take the place of alum. However, as most practical mill men know, this absolutely is not the case. These materials cannot be substituted for alum. However, under certain circumstances, they could be used more or less successfully as foam preventatives, and in this respect be substituted for alum which is often used for this purpose at the present time.

Qualities Desired in a Papermaker's Alum

The above apparent digression into the subject of rosin size was made in order to give the practical papermaker an insight into the work actually performed by the alum. It will readilly be seen from the above description that for precipitating or "setting" rosin size, the papermaker is interested primarily in one thing, namely, the content of ALUMINUM. In addition to high aluminum content, the papermaker is interested in low insoluble, low iron, and low free acid. These undesirable materials are very apt to be present in commercial sulfate of alumina, since it is made by treating certain minerals, such as Cryolith and Bauxite with sulfuric acid. If the mineral is not extremely pure, it is sure to contain greater or lesser quantities of iron, silica, quartz, etc., which are quite apt to get into the finished product. In addition to this, if great care is not taken in the conversion of the mineral into alum, the product will certainly be contaminated with insoluble mineral matter or free acid. Obviously, this acid is an extremely undesirable impurity, and its detection is a matter which requires considerable care.

Analysis of Alum

The analysis of alum is a rather difficult matter and should not be attempted by anyone who has not the equivalent, at least, of a high school training in chemistry. However, brief instructions, which may be of interest to some, are given below:

Sampling.—The best instructions for sampling alum are "take all the conditions into consideration, use your head, and be very careful to get a representative sample." In cases of dispute, it is required that samples be taken from at least 5 per cent of the bags or barrels in car, in order that the composite may be representative. Obviously, parcels which have been rained on or otherwise contaminated in transit should not be included in the sample. The taking of a proper sample requires, above all, careful observation and thought on the part of the sampler.

Insoluble Matter.—Insoluble matter is determined by weighing out 25 grams of the powdered sample on an analytical balance and dissolving it in 200 c.c. of hot distilled water. The solution is filtered through a Gooch crucible which has previously been dried and weighed. After thorough washing with hot distilled water, the crucible is again dried and weighed. The increase in weight multiplied by 100 and divided by the weight of sample taken gives the percentage of insoluble matter. This figure should not run over two-tenths of one per cent in ordinary grades of alum. However, some of the so-called iron-free alums normally run as high as one and one-half per cent insoluble.

Alumina and Iron Oxide.—In determining alumina and iron oxide, the filtrate from the above is carefully rinsed into a 1,000 c.c. measuring flask, cooled to the temperature of calibration (which is usually

given on the flask), and diluted to the mark on the neck with distilled water. After thorough shaking, 20 c.c. of the solution (equivalent to .5 grams of alum) is transferred to a 400 c.c. beaker by means of a twenty c.c pipette or a burette. To this is added about 200 c.c. of distilled water, 5 c.c of concentrated hydrochloric acid, a few drops of concentrated nitric acid and a "pinch" of tannin. After heating the mixture to boiling, dilute ammonia is added until it is in slight excess, as shown by the odor. The boiling is continued for one minute, when only a faint odor of ammonia should be perceptible. The beaker is removed from the flame and its contents carefully rinsed into an eleven centimeter washed filter. The precipitate is washed on the filter with hot water until free from chloride, as shown by the silver nitrate test. It is then dried and strongly ignited for one half hour in a platinum or porcelain crucible over a number four Meeker burner. After cooling, the crucible and its contents are carefully weighed. This weight minus the weight of the crucible gives the weight of combined aluminum and iron oxides in the sample. The weight of combined oxides multiplied by 100 and divided by .5 gives the percentage of combined oxides. If the per cent of iron, found as described below, is multiplied by 1.44 and subtracted from the per cent of combined oxides, the result will be the percentage of alumina in the sample. A good commercial alum should contain at least seventeen to eighteen per cent alumina.

Iron.—In determining iron, a ten gram sample of the alum is carefully weighed out and dissolved in 200 c.c. of hot distilled water, containing about ten c.c. of concentrated sulfuric acid. Potassium permanganate solution is added, drop by drop, until a permanent pink color is produced. The solution is heated to boiling, a few pieces of pure zinc are added, the beaker covered, and allowed to stand for about ten minutes. The solution is cooled to about room temperature and filtered at once through loosely packed glass wool into a 500 c.c. Erlenmeyer flask. The glass wool is quickly washed with cold water, and the filtrate at once titrated with twentieth normal potassium permanganate solution to a pink color which persists for one minute. The volume of standard permanganate used multiplied by the product of the normality factor and .55 gives the percentage of iron, where a ten gram sample of alum is taken for analysis. The alum used for writing papers should not contain over one tenth of one per cent of iron, and that used for the cheaper grades of paper should not run over one half of one per cent.

Sulfuric Anhydride and Free Sulfuric Acid.—It is the writer's belief that the determination of sulfuric anhydride is unnecessary in the case of papermaker's alum. However, when desired it may be determined as barium sulfate by the methods always found described in standard works on quantitative chemical analysis.

As contrasted with sulfuric anhydride, the determination of FREE SULFURIC ACID is of great importance. In making the determination, ten grams of alum are dissolved in 25 c.c. of warm water and a few drops tropaeolin indicator added. If the solution shows an orange color, the alum contains no free acid; but if the solution turns red, free acid is present, and, if possible, the quantity should be determined. This may be accomplished by adding tenth normal sodium hydrate drop by drop from a burette until the alum solution turns from a red to an orange color. The number of c.c. of standard sodium hydrate solution required to produce this change is carefully read from the burette. This number multiplied by the product of the normality factor and .490 gives the percentage of free sulfuric acid in the alum. A good alum should contain no free acid whatsoever.

The tropaeolin indicator mentioned above may be obtained, together with instructions for its use, from E. H. Sargent & Company, 125-127 W. Lake St., Chicago.

Economies in the Use of Alum

In most paper mills, the opportunities for saving alum are very great. The tendency on the part of beater men and machine men is to demand a tremendous excess of alum. This excess, furthermore, continues to increase as long as the consumption is not carefully checked up. The writer knows of one mill where carelessness in this regard is allowed to reign supreme. In the past five years, though running on practically the same grade of paper, the alum consumption (figured as a percentage of production at the reel) has increased from four per cent to nearly ten per cent. Incidentally, at the present date, the percentage consumption is still mounting, even in spite of the present condition of the chemical market.

In connection with economizing in the use of alum, the following suggestions may be made:

1. Keep tab on the alum as though it were cash.
2. Hold the beater engineer responsible for alum consumed.
3. If at all possible, arrange to store the alum on a floor above the beaters; or, at any rate, store it in a place such that it is available only to the proper persons.
4. Under no circumstances allow alum to be used dry.
5. See to it that alum dissolving tanks are of adequate capacity and that they do not leak.
6. Make the beater engineer realize that he is handling a valuable material and that any excess of alum over and above that required to give the stock a faintly acid reaction to Litmus is an absolute waste. If it is not possible to make him see this, keep your eye peeled for a new beater engineer. It will pay you.
7. Keep well in mind the fact that alum consumption is bound to jump and continue to jump as long as you neglect keeping careful tab on it.

Power Plant Management

The Use of Instruments

By ROBERT JUNE, M. E.

HOW are you to know whether you are at all times maintaining the highest practicable efficiencies in your boilers? Well, how does your physician determine the operating efficiency of your body? Through the use of gauging and recording instruments, doesn't he? And just as the medical man needs his watch, thermometer, stethoscope, blood count apparatus, and blood pressure machine, so does the power plant operator need his clock, draft gauge, Orsat, CO_2 recorder, steam flow meter, and gas temperature recorder.

The Clock

I have mentioned the clock first. It isn't the most important instrument, but it belongs in every boiler room, and can be put to unsuspected uses. One power plant operator of my acquaintance has had a great deal of difficulty, due to general industrial conditions in his vicinity, in getting labor of any sort, experienced or inexperienced, for his boiler room. He sometimes has had a complete labor turn-over in two weeks. Green hands have not only not known how, they have not known when to fire, and they have resented the foreman's constant admonition to fire up, or to withhold firing and give combustion a chance. As a result firing has been exceedingly erratic, and boiler efficiency something to dream about.

The irregular firing phase of the problem has been largely solved by connecting up the clock with an electric bell. Every five or six minutes the alarm sounds, and promptly on the dot the fire doors are opened in unison, the fires are sliced (if required) and a standard number of shovels of coal thrown in the furnaces.

This standardization of time of firing has produced a marked increase in the efficiency of this plant. The boiler room fireman has now only to devote his attention to condition of combustion. Contrary to expectations, the firemen have taken kindly to the innovation. They receive a bonus for high CO_2 and have found their pay checks increased about 10 per cent. In addition they are actually shoveling less coal and have more frequent rest periods.

Changes in load involving the cutting out or in of boilers at stated times, should always be scheduled on a bulletin board, arranged with a clock in close proximity.

The Draft Gauge

The draft gauge is the fireman's best friend. I have made this statement with due consideration of all the factors entering into successful boiler operation. It enables the fireman to produce the largest amount of steam with the least amount of coal handling.

The draft required to effect a given rate of combustion depends upon the kind and condition of fuel, the thickness of fire, type of grate and efficiency of combustion, and can only be found accurately by experiment. For every kind of fuel and rate of combustion, there is a certain draft with which the best results are obtained. The curves in Fig. 1 give the furnace draft necessary to burn various kinds of coal at the indicated rate of combustion for average operating conditions. These curves allow a safe margin for economically burning coals of the characteristics noted. Specific figures for the various types of stokers may be obtained from the manufacturers.

When combustion is progressing properly the quantity of gases will be in direct proportion to the load. The boiler through which the gases pass has a constant resistance (constant, that is, for the individual boiler—different sizes and makes of boilers have different resistances). The function of the draft gauge is to indicate the differences in pressure between the point or points with which it is connected, and the atmosphere. A simple draft gauge is connected to one point, a differential to two.

A draft gauge, connected to show the pressure drop through the fuel bed in connection with one showing the drop through the boiler, will indicate any change in the fuel conditions. A relative increase in the fuel bed drop will indicate that the bed is becoming thicker or that it is becoming clogged with clinker, etc. If the pressure drop becomes less, it indicates that there are holes in the fire, or that the fuel bed is too thin.

There are a number of good draft gauges on the market. One of them is the Hays.

The Ellison consists of multiple differential gauges, and a simple U-gauge. This latter indicates the blast, while the upper inclined gauge shows the furnace draft, and the lower inclined gauge the drop between the flue and furnace (boiler resistance).

The Blonck efficiency meter, Fig. 2, consists of two different gauges, one indicating pressure drop through the fuel bed, the other through the boiler.

The Bailey boiler meter combines the differential gauges of the efficiency meter with a steam flow meter. The two draft gauges, etc., are of the recording type, and are enclosed in the same case with the steam flow meter, recording on the circular chart.

The pressure drop in the boiler gas passages is an indication of the quantity of air passing through the boiler, and the pen recording this pressure is set to record just ahead of the steam flow pen. When the two lines practically coincide, the air is in the proper proportion for the load on the boiler. A pen controlled by two different pressure meters of the

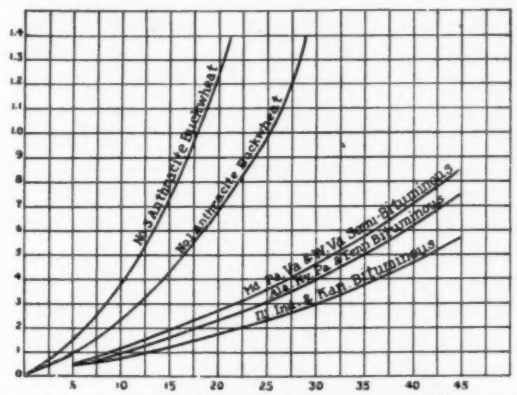


Fig. 1—Draft Pressure Necessary to Burn Various Grades of Coal Effectively

inverted type, attached to the arms of a balance, called the furnace indicator, records on the outer portion of the chart. The steam record is made as a percentage of the rated capacity of the boiler.

The pressure drop across the fire varies with the resistance of the fuel bed, and also with the rate of flow of air through the fuel bed. The furnace indicator compares the pressure drop across the boiler, eliminating effects due to the rate of flow of air, and thus obtains a net result which varies only with the resistance of the fuel bed. While this type of apparatus indicates what is going on in the furnace boiler, the operator must have sufficient intelligence and skill to be able to interpret its indications and adjust conditions.

In concluding this discussion of draft and draft gauges I cannot do better than quote a statement once made by that master engineer of boiler-room operation, Joseph W. Hays: "Visit your boiler-room today and note how your firemen manage the drafts. If there are draft gauges on your boilers you will first be interested to see whether the firemen are paying any attention to the gauges. If they are not, it is the fault of somebody about the plant —not the firemen. It is a waste of time and money to equip your plant with anything that is not going to be used. Now watch the firemen.

"The boiler dampers are wide open. The danger in the main breeching, if there is one, is wide open also. The firemen act upon the theory that draft is made to be used and that if some draft is a good thing, all of the draft that can be obtained must be better. They take the whole box of pills at one dose.

"The rule, when designing a power plant, is to provide for an excess of draft. Dampers are furnished in order that the draft may be under control. The boiler damper has the same relation to the furnace that the throttle bears to the steam engine. The firemen should set the dampers to give the draft that is called for—no more and no less. The dampers should never be wide open except under the most extreme conditions of load.

"You will notice, most likely, that the firemen use the ash-pit doors to check the draft when the steam approaches the popping point. They have discovered that this is a very effective way to quiet the enthusiasm of the boiler. They do not know that it is the wasteful and improper way. If there are draft gauges on your furnaces, you will observe that the vacuum is greatly increased when the ash-pit doors are closed. This multiplies the inflow of air at all of the cracks, crevices, holes and other openings about the boiler. The uptake temperature rises. Steam is being checked all right, but heat energy is being wasted.

"It is just as easy to close the boiler dampers as it is to close the ash-pit doors, provided the dampers are furnished with the proper means for exercising manual control. The boiler damper controls should be so arranged that they may be worked, and worked easily, from the fronts of the furnaces. The firemen should be compelled to use the dampers in preference to the ash-pit doors. The latter should be removed, if necessary, to get the firemen in the way of using the dampers."

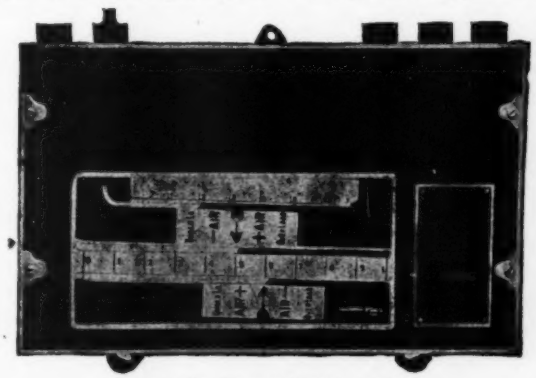


Fig. 2—The Blonck Efficiency Meter

The Why of Flue Gas Analysis

The products of combustion, resulting from complete oxidation of coal with theoretical air supply, consists chiefly of nitrogen and carbon dioxide, with lesser amounts of hydrocarbon. Excess air results in the presence of free oxygen in the gases. Evidently an analysis of the flue gases offers a basis for judging the efficiency of combustion.

The following are things to be studied and adjusted:

1—The firing and handling of the fire.

(a)—Selection of proper firing method for the coal in use (cooking or spreading methods).

(b)—The proper leveling of the fire to keep it free from air holes.

(c)—The proper depth of fire.

2—The draft for the thickness of the fire and the load.

3—The setting, which should be free from cracks.

4—The secondary air supply, which must be provided to complete combustion.

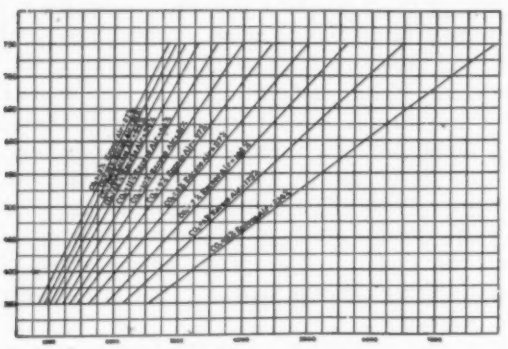


Fig. 3—Loss Due to Heat Carried Away by Chimney Gases for Varying Percentages of CO_2

5—The furnace construction.

If the gas analysis is to have any value the sample on which it is based must be as nearly an average as it is possible to obtain. There is diversity of opinion as to the best method of obtaining the sample. The Bureau of Mines recommends a water cooled tube or a quartz tube, as preferable to a metal tube. The A. S. M. E. test code recommended a plain perforated ¼-inch gas pipe. As between the two, the Bureau of Mines recommendation would seem preferable.

The use to be made of a gas analysis determined the location of the sampling tube. If the total heat losses are the desired data, the sample should include air leakage into the setting. If this information is to be used in controlling the fire, the sample should be taken at some point before the gases are diluted by leakage through the setting.

Remember the boiler damper in placing the sampling tube, so that the tube is not placed in a gas pocket. Particular attention must be paid to preventing air leakage around the sampling tube, which might give a false indication of the composition of the gases. In a B. & W. boiler the sampling pipes can be thrust through the blow-hole at the last pass. In a Heine boiler the pipes can be run through one of the hollow stay bolts. In a return tubular boiler the top handle can be removed from the boiler doors. Place the tube six inches from the boiler head and above the top row of tubes. If it is put in too far it may come to a dead space. Be sure to get none of the air leakage around the doors. If air leaks in at the rear arch, most of it will find its way through the upper arches.

The Orsat apparatus recommended by the Bureau of Mines for CO_2 determination is shown in Fig. 4. It can be purchased either in the form shown, or in a modified form, from a number of reliable manufacturers. Full directions for its operation are given in the Bureau of Mines Bulletins, or may be obtained from the manufacturers.

While hand indicators, such as the Orsat, can be used as a means of studying air-supply conditions or for occasional tests, they do not answer the purposes of daily operation, since the CO_2 content of the flue gases may, and does, vary widely, rapidly and continuously, due to the fact that the proportions of the air-supply, which comes through the fire and in above the fire, are easily upset by throwing on of fresh coal, the burning through of thin spots, accumulation of clinker and ash, manipulation of dampers and fire-doors, etc. It can hardly be said that CO_2 recorders act promptly enough to follow the variations in CO_2 from minute to minute, but they do, on the other hand, produce a chart showing an average, which serves as a warning to the fireman who is careless or incompetent in his management of the fire and draft.

Remember that while high CO_2 indicates a small

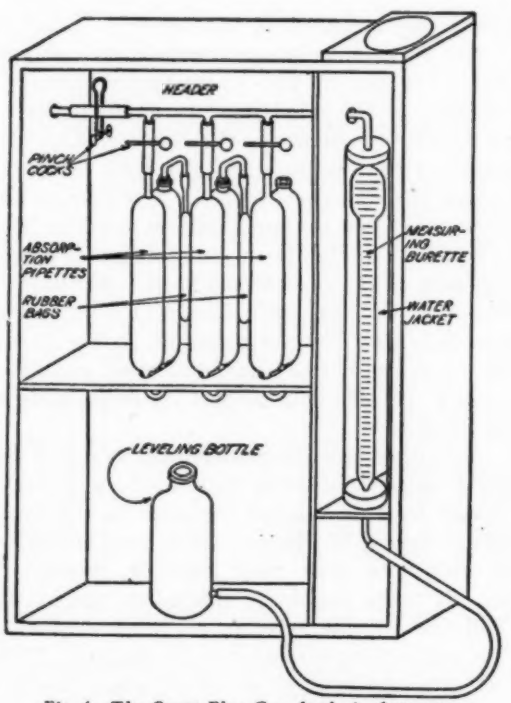


Fig. 4—The Orsat Flue Gas Analysis Apparatus

amount of excess air, it does not necessarily mean correspondingly good combustion.

Low CO_2 may be caused by excess air, insufficient air (high CO), or improper mixtures of the air and gases, but a surplus of air is the cause in almost every instance. The difference between the CO_2 percentages in the last and first passes indicates the air leakage in the setting.

We must not attempt, however, to secure high CO_2

by cutting down the draft only. High CO_2 can be obtained with any draft in reason, either high or low, provided the draft and the fuel resistance are in proper relation. CO_2 percentage indicates the ratio of air used to the air that has not been used. It is sometimes feared that 8 or 10 per cent CO_2 cannot be obtained without CO in considerable quantities. This is not in accordance with general experience. There is little danger from CO until 15 per cent CO_2 is reached.

The percentage of CO_2 is the index of the amount of heat being wasted up the stack. It is little realized how large a return will result from a small increase of average per cent of CO_2. The chart of Fig. 6 shows, for instance, the dollars saved per 100 boiler h. p. operating 365 days a year, 24 hours per

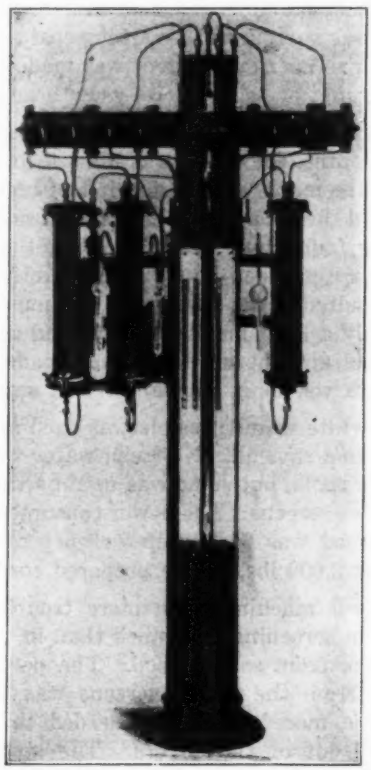


Fig. 5—Uehling Continuous CO_2 Recorder

day, for various prices of coal, and corresponding to an increase in CO_2 from any original figure to any final figure. Suppose, for instance, that the original per cent of CO_2 is 7 and that after equipment with CO_2 recorder, the average CO_2 is increased to only 8 per cent. Starting at the 7 per cent mark of the horizontal line of this chart, and rising to the 8 per cent curve and then running over horizontally to the left, we find that with coal at $4.00, this increase of CO_2 means a yearly saving of $375.00. This, of course, is for 100 boiler h. p. operating continuously. If the load factor instead of being 100 per cent were only 25 per cent, the saving would be one-quarter of $375.00, or $94.00 per 100 boiler h. p. and for a 500 boiler h. p., 5 x 94 equals $470.00.

The CO_2 indication answers most practical purposes. If greater certainty is desired after the CO_2 has been brought up to the desired per cent, the CO

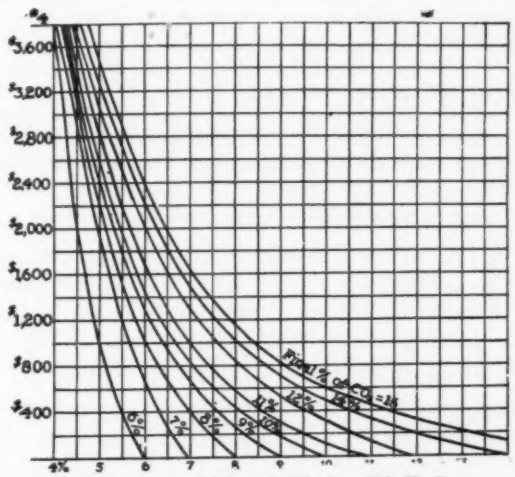


Fig. 6—Cost of Wasted CO_2 Per 100 H. P.

determination can be made. The formation of CO is due to the following:

1—Furnaces of poor design.

2—Improper methods of firing.

3—Character of fuel, particularly with reference to equipment with which it is burned.

4—Improper mixing of combustible gases with the air.

5—Low furnace temperatures, so that the gases are cooled below the ignition point.

6—Deficient air supply.

The formation of CO is usually due to insufficient air supply, which, as pointed out by the Bureau of Mines, may be either local or general. Either the local or general causes may be from the composition of the coal. The coal may be fusible, in which case the surface of the fuel forms one solid layer of semi-liquid fuel, which effectively stops the passage of air. At the same time a large excess of air may be fed into the furnace elsewhere. The same local excess of insufficient air supply may be caused by the fusion of ash on the grates. The volatile matter may be driven off so rapidly after a fresh charge of coal that the average air supply is not sufficient, whereas a couple of minutes after firing it is too large.

The occurrence of CO in the water gases is a decided danger signal, not so much on account of the loss which it represents, but because it is usually accompanied by unconsumed hydrogen and hydrocarbon.

Flue Gas Temperature and Efficiency

Flue gas temperatures should be taken with a continuous instrument. They serve a number of useful purposes.

1—Call attention to leaks in boiler setting. In

Continued on page 598

The Grinding of Wood Infected by Fungi

By W. A. MUNRO

Believing it possible to obtain a better pulp from infected wood, the author made several experiments and the following account he considers to be the best procedure in grinding the infected wood to secure maximum yield and strength and to obtain a pulp that will not deteriorate rapidly in the storage pile.—Editor.

DUE to the present wood shortage and great demand for ground wood pulp, it is necessary not only to use wood that would formerly have gone to the boiler house, but also to secure a good grade of pulp with a minimum of horse power.

The wood used, which consisted of approximately 80 per cent spruce and 20 per cent balsam, had been piled on the yard in eight foot lengths for a period of two years. It contained some dry rot and a considerable amount of wood destroying fungi. The affected part of the wood was mostly around the circumference and on the ends, but did not penetrate more than an inch from the bark or the ends. The infected wood was red in color, brittle and much lighter in weight than the sound wood.

In grinding the wood, three things were desired: (1) To utilize all the wood that had any pulp making possibilities and cull only what was entirely rotten; (2) To secure the greatest yield possible and the best quality at the smallest possible horsepower; (3) To kill or reduce the activity of the wood destroying fungus as considerable of the stock was to be stored for future consumption.

The wood was cut into two foot lengths, barked dry in an American Drum Barker and piled in racks in front of the grinders. The grinders are all direct connected to hydraulic turbines, one stone on a shaft and run at a peripheral speed of about 3,600 feet per minute.

The pressure carried on the 14" cylinders was 50 lbs. and on the 16" cylinders 40 lbs. This gave practically the same total pressure on the wood in the pockets of both types of grinders.

It was the object throughout the run to keep the speed, pressure and temperature uniform, and make the result entirely dependent on the surface maintained on the stone.

Two burrs were used, a straight cut and a diamond. The sharpening was done by a lathe and the stone slowed down to about 100 revolutions per minute during the dressing. The straight cut was put on first, after the stone had been smoothed off with a dull diamond; the straight cut was put on solid, but not so hard that the stone would break out between the parallel lines. Then the diamond was lightly run across in the opposite direction from the way the marker was run. The diamond burr used should always be sharp as a dull diamond will only take out the mark and smooth up the stone. The sharpening should always take place at equal intervals of time, all the stone should never be sharpened at once, but a proper sequence worked out.

The stones were run hot all the time, the temperature of the stock in the grinder pit was 168° F., that of stock taken from the upper pocket, 184° F. All the steam possible was held in the pockets and the wood was surrounded by a temperature of 192°. By running so hot, an endeavor was made to destroy the wood fungi or to check its growth and activity.

The mark on the stone would last about thirty six hours. At first, the stone was allowed to run until nearly all the mark was off and it had become quite smooth, and then remarked, and the diamond put on, but it was found later that by using the diamond lightly every eighteen hours a more uniform grade of pulp resulted. The pulp made without the mark or with only a light mark was slow and contained a considerable amount of flour; that made with too deep a mark was long, wiry and full of small slivers.

All the white water possible was used and the excess went to a save all. No fresh water was used in the grinder room, but some was used on the showers of the tailing screens. The power consumed in grinding this wood was 65 horsepower per ton and the yield about 2,000 lbs. to the prepared cord.

In the wet machine room more trouble was experienced in screening this stock than in the screening of stock from sound wood. The percentage of rejections from the rotary screens was larger and considerable more water was needed to wash the good stock out of the slivers. The stock foamed badly especially in the wet machine vats and the laps had a distinct reddish color. The lapped stock was 1½ to 2 per cent wetter than sound spruce stock. It had a tendency to fill up the felts which caused a crush on the roll and necessitated a good shower on the felt and the whipper put on strong.

The stock ran quite well on the paper machines, requiring the addition of only 14½ per cent sulphite to obtain a Mullen test of 9½ lbs. per square inch on a 32 lb. sheet. However, it acted extremely free and required the addition of a large amount of water on the paper machine to secure a good formation.

The lapped stock from the wet machines was piled by itself and will be observed from time to time for indication and rate of fungus growth.

From the Outside Looking In

By FREAS B. SNYDER
W. C. Hamilton & Sons

Presented at the Annual Meeting of the Cost Association of the Paper Industry, on May 17, 1920, at the Hotel Cleveland, Cleveland, Ohio

IT is fair to assume that this title which has been handed me is quite as perplexing to you as it is to me. But on analysis, it seems to be a somewhat facetious way of expressing that highly important viewpoint known as perspective. You are all familiar with the results of an amateur photographer's attempt to take the picture of a horse coming toward him or a person stretched at full length on the grass along the focus line of the camera. In the one case, the picture is all head and in the other all feet. The photograph has no perspective and it sells at a nominal price. The painting of a master hand is accurate in its perspective and it commands a fabulous figure.

Those of us who spend our days in an industry, work so close to it that we are in danger of losing our perspective. When we do so, our value as a human factor in production declines to that of a machine and our worth in comparison is as the painting to the photograph.

Within recent months, I have heard a true story of a paper mill from the lips of a stranger to it who saw it from a different and, I believe, a true angle. There is such value in his viewpoint and such an aid to the maintenance of our own perspective that I have been emboldened to come before you today and repeat it as best I could in plain, homely words, without oratorical embellishments.

An Old Paper Mill

My friend who told me this story, recently came into control and management of a moderate sized paper mill. The plant was established as a two-thousand-pound mill in 1853, in a somewhat out-of-the-path-of-travel location, in a little valley where paper making traces a direct lineage to the old Rittenhouse mill where in 1690 paper was made by man for the first time on the American continent. This statement is advisedly qualified with the words "by man," for it was not for a century and a half that we discovered that the wasp had been pursuing our occupation since animal life began.

This little mill had doubled and tripled its capacity time and again, and had added a pulp mill. In so doing, it had grown around in a circle without any regard for the later discovered tenets of scientific and economical manufacturing. Materials crossed and recrossed during the process and only the utilization of mechanical conveyors and the possibility of transporting pulp and half stuff in solution had made possible manufacturing at any profit whatever.

The owners of the mill had grown gray and comfortably well off in its service. To them paper making was as the devotion of a high priest. To produce better paper, to make paper of special characteristics which others could not make, to contribute a little to the scientific side of the industry was the aim and end of their existence. If I were only at liberty to tell you this story with names, there are a hundred men of skill who would rise up and say that paper making is far richer because these men have lived. God grant that you and I may erect such a monument to our memories.

But because they were good paper makers these men were not good business men. The office was a necessary evil, intended to provide enough money to enable them to go on making paper, but it was the hired man's job. The plant location and the owners' concentration on the laboratory gave no contact with the market, and market conditions and selling prices were fixed by whims and fancies, by weather and digestive conditions, by the words and ideas of a salesman calling to buy or sell and resort to parrot talk while he bargained.

Age crept on, profits were not commensurate; the owners, after nearly sixty years of active business life, grew tired and overcautious and disinclined to progress and make improvements.

A New Man on the Job

So there came into the business a new element. As far as I was enabled to discover, his qualifications consisted chiefly of a vast and colossal ignorance of anything having to do with paper making, a good banking and business training, a knowledge of the value of technical advice, and a confident belief in the value of coöperation and trade organizations.

His ignorance enabled him to start without preconceived ideas of how things ought to be done, and without prejudices. His banking specialization had been in credits and he could marshal facts, analyze figures and make reasonably accurate deductions. An important part of credit work is the inspection of the plants of borrowers, and he had learned something of modern manufacturing ideas in this way. Knowing how little he knew, he had no false pride about working out his own problems and no hesitancy in calling in experts when he found himself in too deep. All his business life he had found pleasure and profit in working with men in furthering a common purpose, and he knew that trade organizations were real aids and not avenues for sharing your manufacturing secrets—if any such there be—with your competitors.

Business Depression

The problem first facing him was the fact that a depression prevailed and for six months the plant had run at 60% of capacity. On looking around he discovered that other mills were undergoing similar experiences but not quite so acutely. That looked as if the question of distribution might be involved. Investigation disclosed that the product had never been sold.

There were no salesmen, no selling organization. The quality of the product was so generally recognized that people bought it without urging, even without solicitation, in normal times. But when depression stalked abroad, cheaper papers were substituted and the few orders available went to the mills interested enough to come after them.

The problem of distribution is tied up with the question of price. How much farther can we reduce our prices to meet competition and still make a profit? How low can we afford to sell our product in order to keep the organization together and help carry the overhead through a dull period without profit? Where is the vanishing point?

Costs Unknown

My friend's next inquiry was how costs were figured. He found, as he had rather expected, a rule of thumb computation, as full of holes as a Swiss cheese. A running inventory was unknown. About April first of each year they knew whether they had made or lost money in the year ending the previous December 31, if the accountants who made the annual audit were not too busy.

Then they added up what they called the "overhead" for the previous year. That overhead included all chemicals, supplies and materials except the most important items of raw stock—it included labor, interest, taxes, salaries, and almost everything except the kitchen stove. The items which could not be definitely assigned to either the pulp or the paper mill were approximated, the results were divided by the pounds of production and the cost of paper for the succeeding year was established.

My friend then knew that his first problem was to find out what his goods cost to produce and market.

Solving the Problem

The accountants were asked to study the question of remodeling the bookkeeping and tacking on a cost system. My friend, in his credit work, had made a study of cost keeping for many years, had taken it as part of his university course, had been rather insistent that the bank's borrowing customers should know their cost and he could tell a good system when he saw one. In fact, he thought the problem was a little more than half solved when he put his finger on it and about three-quarters answered when he told the accountants to "hop to it."

In the lap of this pleasant delusion he slept content until the report came in. It was a good report and a good system. But would it work? What did the accountants know about a paper mill? The practical men in the organization pointed out a few things which they said would keep them so busy getting at costs that there would be no time to make paper. Everyone knows that the manufacture of paper is essential to the monetary maintenance of a good cost system, so that the objection was admittedly well taken.

At this point, a friendly paper jobber consulted, said he thought that the Crocker-McElwain Company up in New England somewhere had made quite a study of cost accounting—had, in fact, published a pamphlet about it—and, most surprising of all in view of certain well known Yankee characteristics, were not averse to telling about it.

So my friend, true to his financial training, went to Moody's Manual instead of Lockwood's Directory, and found the company located in Holyoke, picked out the treasurer's name and wrote to find if it was all so. The treasurer replied that he didn't know much about it, but that they had a little side-line business where the theoretical men worked, and so he had sent the letter down to the Chemical Paper Manufacturing Company.

By and by a letter came along from a fellow named Bush, and my friend said it sounded like it was written by an honest-to-God man. It told about the C. A. P. I., said a report of the Committee on Cost Accounting from the Cover Paper Manufacturers' Association was coming under separate cover, that he would be glad to consult with my friend at his plant or theirs, and that the C. A. P. I. office was at his disposal. But never a word about joining anything.

Since then I have seen that report, and I know my friend did not exaggerate when he said that it was the finest piece of work on a highly technical subject in its simplicity that he had ever seen—and he is no mean authority. It is a road map of cost accounting, showing only main highways, avoiding all controversial routes and doubtful shortcuts. Those are worthy of further investigation in the future, but the traveler going over the road for the first time wants it charted plain and straight from starting point to destination.

Joins Cost Association

They let my friend into the Cost Association when he applied and he attended, on invitation, a meeting of the Executive Committee. He met a great big one named Burchell, whose shining dome proves that they never put a marble top on cheap furniture, shook hands with Bush and liked him, listened to Hutchinson and requested more ventilation.

And these fellows seemed so sincere in their desire to help that a few weeks later our hero put the accountant's report in one trunk and the suggested

forms in another, bestowed his watch and wallet on the safety first principle and journeyed into New England. His first port of call was the American Writing Paper Company, where no one had anything to do that day but see that he got what he came for. His idea was to get these two Holyoke experts who run the propaganda, speech-making and local organization end of the Cost Association and work in paper mills in their off moments, to examine Exhibit A, trunk containing report, glance over Exhibit B, trunk containing forms, and say if it was all right to go ahead.

Well, he told me afterwards that Hutch read the first page and a half of the introduction, looked up and said, "Did your accountant recommend the budget system of cost?" Having read the report endlessly and never having met the gentleman, he followed the illustrious example of Steve Brody and said, "No!"

Bang went the lid of Exhibit A, and the rest of the day, until Hutch started for Boston in his red devil and a trail of smoke and smell in the wee sma' hours, "budget costs" were the sole topic of the monologue.

The next morning was spent in chasing Bush out of one conference and into another until he caught him in between two about lunch time. Bush said, "I can't shake him, boys. You confer without me for the rest of the day," and capitulated.

My friend put the proposition to Bush a little differently. He said, "I believe in budget costs. If I don't, Hutch is coming down to my house and talk until I do, so I must believe in them. But we are reforming our entire accounting. We have no records to serve as a basis for a budget. This system provides all that is needed in the mill for budget costs. Any changes will be in the office. Isn't it wise to put this in, get in running, and when the mill is organized and going smoothly, swing over to the budget system?"

Bush called in a tall guy named Balch, whose head seemed to be something more than a place to hang his hat, and they had a Donnybrook Fair with Exhibit A and Exhibit B. When the rumpus quieted down and the casualties had been counted up, Bush delivered the verdict in these well-chosen words, "With these few changes—shades of Aristotle, the mathematician, if these be few—and under your conditions, provided you do not permit yourself to grow contented with what you have, I believe your best course is to put in your accountant's system, and when it is going to suit you, change over to the budget."

Installing a Cost System

Back hies my friend, gets his chief accountant busy, analyzes the project in conference after conference with superintendent, millman, office and accounting department all represented. Only those of you who have been through it know the infinite tact, patience, forbearance, foresight, required to steer these conferences through to a successful consummation. Old prejudices must be broken down, concessions must be made, the balance between too much and too little system carefully preserved.

Some of you may have heard President Taft describe the first week of the War Labor Board when everybody said the worst things he could about everybody else on the Board, and at the end of that time they had to begin to plan something, for the venom was all gone and they had nothing left to talk about. These conferences were not quite as bad, but out of them grew the same respect for the other man's viewpoint and the same understanding that he, too, had problems of difficult solution.

The foremen held the next trench. They gathered one night for dinner at the invitation of the executives. The restaurant selected was one which they frequented, and the food was the plain, he-man kind. Even with these provisions, there was a strained, stiff feeling at first, but it gradually wore off.

They talked of many things and the men felt bold to make suggestions of the things they would like to see happen. The old method of bookkeeping was described to them, the purposes of the new explained and their interest in the results fixed by knowing that their share of the selling price could be better ascertained.

The First Reports

The following week the first reports of materials received, materials issued, requisitions and purchase orders went into effect. There was no opposition, but an honest effort to understand what was wanted and to do it. For the first week there was a clerk with each shift to make the need clearer, the method plainer. Since then the men have done the work alone.

What is the result? Is it a full-fledged cost system working without a hitch? It is not, and it will not be for months to come. But the mill knows where it is going, and it is on the way.

On the Right Track

Step by step, it goes on toward knowledge. Now it knows its profits accurately from month to month. Tomorrow it will know the profits on individual orders. In a litle time it will know what orders should cost, what is wrong when they cost more and where the saving is when they cost less.

Its selling prices will be based on facts, and it will contribute as much to the stabilization of the industry and to clear, honest, hard-fisted competition as its founders did to the technical upbuilding. No little part of that result is directly traceable to the Cost Association and to the men interested in it.

A few words more and I am done. Reflect that industry is on a new basis. We are coming to the time

when we will be recognized as workers, all, employer and employe, not capital and labor. The employe wants and will have his participation in management and the results of his labor, whether by profit-sharing, by sharing in the economies of operation, by better living and working conditions, by higher wages and shorter hours. Insofar as the securing of these benefits bring him into closer relationship with his employer and let him stand where he can see both sides of the picture, it is for the good of industry and the good of mankind.

The average employer wants to go as far along this road as is consistent with a fair return on his investment and with the right to run his business as he and his associates in office and mill see fit.

Cost accounting must chart the course. On it rests the responsibility of how far industry can go. If its views are too narrow, the struggle is prolonged and deepened in bitterness; if too liberal, industry is wrecked. "See ye well to this."

Since my friend went as far as he did in telling me of his views "from the outside looking in," I ventured to ask one more question:

"What kind of men have you found in the paper industry?"

His reply was characteristic: "The kind of men I would expect to find in any industry of such importance, basically and financially; plain, decent, honest, upright American business men; men willing to take a chance, if necessary, and willing to give the other fellow one. They are playing the game and playing it hard, in part, I think, for its rewards and its compensation, for it is by them that we measure success in it—and they like to win—but mostly for the sheer joy of playing it. They know the truth of Elbert Hubbard's observation that 'It is not the getting to Heaven, it is the going there, that counts.'

"They want success, but I rather like their conception of it. Mrs. Stanley thus described it:

" 'He has achieved success who has lived well, laughed often and loved much; who has gained the respect of intelligent men and the love of little children; who has filled his niche and accomplished his task; who has left the world better than he found it, whether by an improved poppy, a perfect poem or a rescued soul; who has never lacked appreciation of earth's beauty or failed to express it; who has looked for the best in others and given the best he had; whose life was an inspiration; whose memory is a benediction.' "

And what is the end of all this? Again has it been written for us better than we could say it:

"And I, too, sing the song of all creation—
A brave sky and a glad wind blowing by,
A clear trail and an hour for meditation,
A long day and the joy to make it fly;
A hard task and the muscle to achieve it,
A fierce noon, and a well contented gloam,
A good strife and no great regret to leave it,
A still night and the far red lights of home."

Container Box Board

By HENRY BERT

Presented at the May Meeting of the Northwestern Division, American Pulp and Paper Mill Superintendents' Association

THE article that was published in the October issue of Paper Industry and which was delivered at the October meeting of the Paper Mill Superintendents' Association at Wausau, Wisconsin, has brought forth both comment and criticism. This was expected when the paper was read at this meeting. I am sure that it has opened up a very warm discussion, and before it is definitely forgotten, it is going to develop the chip board quality to a standard that will in a measure justify every mill to prepare for the future of a better box board and for a better fibre box.

The questions of argument have all been advanced on different processes and different methods, and after hearing these arguments, it is very easy to see why this line of industry is not on a standard basis.

The different processes, which I have come in contact with, and which have been brought to the notice of the writer, are as follows:

1. Using hot water in the beaters at 160 degrees Fahrenheit or hotter.

2. Using Rotaries to get the stock hot and then convey it to the beaters.

3. By using warm water about 110 to 120 degrees in connection with Hydrating tanks.

4. Using warm water without Hydrating tanks.

Another argument has been that the conditions of any two mills were not the same. This is true for the simple reason that no two men have the same views of any particular machine, and on the other hand, no individual has the same views of any two machines. It is a fact that paper cannot be made according to rule, as there are not two men who use exactly the same method to make the same grade of paper. However, the methods may vary, in some cases the paper produced is very much the same, even though different methods and different ideas have been used to produce it. Conditions do not make the man. The man has got to make the conditions, and where there are so many different processes entailed in the manufacture of one particular article, you cannot expect to find similar conditions

to prevail in cases of this kind. The different methods now in use are taken mostly to produce the board with a cheap consumption of power. Now if we all had the same grades of stock to start with, we could all of us manufacture with the same amount of power, or in other words, the final cost per ton would be very much the same in all mills.

Costs of Operation Compared

I have been asked how much cheaper a box board mill can be operated with water power as compared with steam power. The surprising answer is that it is cheaper to manufacture by all steam alone, than it is to use water for your power and steam for your heat and drying your paper. The reason this is not understood by most superintendents is simply because they do not familiarize themselves with the steam power and become familiar with the use of the heat obtained from exhausted steam after the power has been taken out of it. One thing you must bear in mind and that is that when you are using water power for your energy, and live steam for heat and drying, you are consuming 100% water power and 100% steam for heat. Now if you take the energy out of the steam by using a steam engine to get 100% power from 100% steam, when this steam has left your engine, you have only lost 5% of the heat temperature. Therefore, it is possible to get power and heat for 105% by using exhaust steam from the engines to dry and heat with after the power has been taken out of the steam, and my contention is that you cannot maintain a water power installation for this 5%. Therefore, the water power does not give a mill any advantage when it is running on chip board or container board. As I have said before, most superintendents do not become familiar with the properties of steam and of the results that can be gotten out of it after the power has been produced from it.

I have been approached by quite a number of patent machinery builders, representing different methods and different attachments to be applied to the beater to make it do the work more economical in the beating of the stock.

Preparation of Stock

Now, my address which was delivered at the Wausau meeting was for the purpose of advocating a better stock to make a standard grade of chip board. My argument was on the lines of preparing the stock as far as it is practical to do so before it gets to the beaters. Then it will improve the efficiency of any beater, or any patent devise that might be applied to the beater.

I haven't any ax to grind for any individual, but I don't believe there is any beater that will make a satisfactory stock or satisfactory board by leaving the dirt in it. Some of them say that they can save power and make one beater do the work of three beaters. I know it can be done so far as the beater alone is concerned, but what power is saved at the beaters must be used on the Jordans in order to get the stock to the required fineness and evenness. You can recall that I mentioned the fact of the declining quality which has prevailed for a period of years in the quality of chip board. This declining quality has been brought about by using more economical methods to produce a cheaper product, and in order to impress upon all of you who are interested in the manufacture of container board, that especially in making a test board, it is simply a question of friction applied to the stock to get the required test. Of course, the higher the test is desired, the stronger the stock must be, and consequently more power is required. To reduce this stock to the necessary fineness and evenness, my suggestion was that all stock be cleaned and dusted before it was taken to the beaters to be made into stock. The large pieces of rubbish of course can be picked out, but I will say that the dusters are more essential than anything I know of to prepare the stock before it is taken to the beaters, as it removes dirt, little nails and pins, sawdust and floor sweepings which are not apparent to the eye. If this stuff is all gotten out of the papers before you put them into the beater, you will find that you will produce a much evener test of board and will save considerable by using less strong stock to hold up your test.

Liner Stock

At the Chicago meeting in November, I was asked to give my idea in the use of No. 2 sulphite in connection with container board. Now I do not mean sulphite screenings. I mean No. 2 grade of sulphite, which might be made from a grade of wood that is not adapted for the better grade of sulphite. Now to use this grade of stock, it is first necessary to have your machine equipped so that you can run a backer liner under the colored liner. The colored liner can be made by using equal proportions of kraft pulp and No. 2 sulphite pulp with any other grade of stock you wish to put in the beater with it. I will make one exception in this case, and that is fibre box cutting, which contains a large percentage of silicate of soda. It is impossible to get good results out of your size and have a water proofing that will be satisfactory, if there is any silicate of soda in the stock. Besides, when this stock is going over the dryers, the silicate of soda burns the fibre which comes in contact with the hot face of the dryer and after the board has been made a few days, it dries out and becomes very brittle. Most papermakers think this is caused by the hemlock sulphite, but such is not the case, as I can show you board that is made from this kind of stock. Hemlock sulphite, in fact, makes a much better container board when properly used than most any other sulphite. It gives the first essential qualifications to container board and that is hardness and firmness and gives just as good a bending quality,

but it is necessary to carry about 2% more moisture with this grade of stock than it does with the other grades. Where ordinarily 6 and 7% of moisture is carried in a 16-point sheet of jute, about 9% should be carried where hemlock sulphite is used.

If you will use two cylinders on liner stock, you will find that you can get along with about 2½ to 3 points of liner on each cylinder and have a good bending sheet and a more satisfactory testing sheet than you can by running 5 points of liner on one cylinder. The main trouble in running a heavy liner on one cylinder is that it makes the liner peel from the board. If the liner is kept down to 3 points on a cylinder, this trouble will not occur. The backer liner can be made by using 75% of No. 2 sulphite and 25% of kraft pulp, with any other stock you may desire to use, and as I have said before, equal proportions of kraft pulp and No. 2 sulphite will work very well in the colored liner.

I find it to be the case that so many superintendents are trying to make a container board by simply using the one liner. This one feature alone has given more trouble than any other feature in connection with the manufacturing of container board. We will assume that we have a 6 cylinder machine, and that 4½ or 5 points of liner are being made on one cylinder and that it is then converted into a 16 point board. Almost one-third of the 16 point board is being formed on one cylinder, the other 5 cylinders simply have a light scum on to make up the balance of the 16 points. If the liner and backer liner method is used, it then gives the machine tender a chance to proportion the stock on his cylinder about the same, and gives a more even and uniform run of board, a higher test with the same amount of strong box, and gives a box that will not peel off when it is rubbed, making a very satisfactory board for container paper.

Manufacture of Jute Liner and Container

By JOHN PFISTER

Delivered at the Superintendents' Convention in Buffalo, New York, June 4-5, 1920

THERE seems to be a difference of opinion in the making of Jute Board. Most of you superintendents have had your experience with test and peeling of your liners. In our last meeting at Menasha, Mr. Henry Bert advised keeping the container clippings out of the filler of the jute liner. I do not agree with Mr. Bert, and I would advise the mills to have the box factories keep these clippings separate for you, bale them, and then use as much as you can afford to use in every filler beater. By this I mean, try to divide it into proportion as to your accumulation of a certain number of hundred pounds per beater. This stock has been ground up and easy to beat up again, and it will not only give you an even test, and a good test, but will help you decrease your kraft and such other high priced fibres as you may be using to obtain test.

Examining the different containers manufactured by the various mills, I found a good many of them have a peeling liner. In other words, you can get hold of the liner at some point of the box, and the liner will hang together until it peels almost all the way around the box. This seems to be quite serious to the customer who purchases that box. He expects to use the container, not only for packing, but for advertising purposes, and we have got to give them a board that will not peel.

I have found that some of the mills are running two liners, running the liner on two molds. In this way it is hardly possible to use less than .006 liner to make a good job of it. It does not seem possible that this can be done at the cost of stock today, and I have experimented quite a bit, trying to prevent the peeling of the liner.

My experience has been to get the liner as short as possible, then running it on the first mold, or in other words, run the liner on the bottom of the sheet as it passes through the wet end of the machine, each couch will have the opportunity of knitting the liner tighter to the filler. My experience also has been that .004½ of liner has been sufficient on any piece of container we have made.

We have the old time creasers in our box factory, and also two automatic machines. The automatic machines have a tendency to abuse the container board more than the old time creaser, but .004½ of liner put on the sheet in the right way, will pass through this automatic double creasing and cutting machine without a crack and make an excellent bender.

I wish also to add that the customer desires a clean smooth box, and in order to do this, I believe it advisable to run a cheap calendar color; this will help cover up some of the dirty stock in the liner, and give you a better looking sheet of board.

Horse Power to Operate Paper Machines, Jordans and Beaters

We have variable speed motors that drive our paper machines and constant speed motors that drive the Jordans and beaters independently. We have our motors fitted with the necessary instruments so that at all times we can obtain the horse power required to do a certain work, and we have obtained some interesting data as to the horse power required

to run the different machines, which I will submit later.

I would estimate that 90% of the paper mills are operating by steam engine, and you will know that it is hard to obtain the horse power necessary to operate the machine from your high speed engine of the different types which are most popular in operating paper machines.

In order to obtain the horse power from these machines, it will be necessary to get a steam indicator and indicate these engines, at the various calipers and speeds which you expect to make. In fact, I might add that it is almost impossible to indicate one of these high speed engines and get a correct reading. This is easier to do with a Corliss engine type, and you may get a fair reading from your engine which operates your beater room, but would find it hard to get a separate beater reading. The same thing applies to get separate desired readings from the different sized Jordans.

Paper Machine Data

The data of horse powers which I am submitting were accumulated in one day from the various speeds and calipers we were working on. The first figures of horse power were taken from a Beloit four deck machine, which will trim 135". The 135" machine has two calender stacks, eighty dryers, three heavy presses and six molds. To the same machine we can add about 18 to 25 horse power additional to these figures when running on rolls. The various horse powers were secured while running sheets. The entire machine consumed horse power at the motor as follows:

Machine running 88 ft. per minute..... 68 H.P.
Machine running 91 ft. per minute..... 71 H.P.
Machine running 93 ft. per minute..... 74 H.P.
Machine running 98 ft. per minute..... 78 H.P.
Machine running 118 ft. per minute.....126 H.P.

On another 112" machine, two calender stacks, seventy dryers, three large presses, five molds, as follows:

Machine running 80 ft. per minute..... 80 H.P.
Machine running 93 ft. per minute..... 87 H.P.
Machine running 112 ft. per minute.....102 H.P.
Machine running 120 ft. per minute.....116 H.P.

On the 112" machine we had three 37" rolls at 93 ft. per minute, and consuming 85 H.P. while the rolls were about 12" in diameter or just starting. As the rolls increased in size, the horse power also increased, and the reading we obtained while the rolls were 46" in diameter was 105 H.P.

If you should be running light weight paper, you can readily see that you have quite an increase in horse power, possibly a little excess back pressure that would have to be relieved to the atmosphere, unless you had other facilities, such as heating beater water, or were equipped with a compound condensing engine so you could take care of the excess back pressure in that way.

You will find if both machines were on heavy paper at the same time, you would not have sufficient amount of back pressure to be able to dry the board, unless you could make it up with live steam, which is very costly. From this data you will find it advisable to lay out the orders on the machines, if possible, in such a way so as to take care of the condition just mentioned.

Jordan Data

We have Jones, Majestic and Standard Jordans, and have collected data on these.

Majestic Jordan:
Jordan running empty, plug pulled back..... 42 H.P.
Jordan running, plug pulled back taking pipe full of stock .....110 H.P.
Jordan running, pipe full of stock and grinding on the shell .....155 H.P.

Standard Jordan:
Jordan running empty, plug pulled back..... 18 H.P.
Jordan running, plug pulled back taking pipe full of stock ..... 31 H.P.
Jordan running, pipe full of stock and grinding on the shell .....114 H.P.

We have Jones fifteen hundred pound beaters.

Beater running, tub empty..... 9 H.P.
Beater roll up, tub full of stock.....40 H.P.
Beater running, tub full of stock, roll grinding fairly hard ..... 53 H.P.

Unless you have a good average, there is not much use in comparing coal consumption, unless you compare them with a mill that is making something near the line of board you are.

Seeing that we are getting along so well in the manufacture of paper, and in order to make our position a regular job, I believe it advisable to hear from the other members as to whether they are willing to tackle some problems in the boiler room, some problems in the engine room, and also some of the difficulties that come up in the electrical end. We do not have to know all about a boiler, all about an engine, all about a motor, but we ought to know some things about this machinery, and after we are better acquainted with this part of our equipment, this is going to make a better job for us. If you are better acquainted with this equipment, you will find that you get better co-operation, understand some of the difficulties, and then may change the orders a good many times to save a shut down.

Secretary Baker Gets Assistant

O. M. Porter, instructor in forest engineering, has resigned from the New York State College of Forestry faculty to go to the American Paper and Pulp association at a greatly increased salary, as assistant to Dr. Hugh P. Baker, secretary, former dean of the College of Forestry.

The resignation is not only one more evidence of the manner in which the industries are looking to the forestry profession for men for practical business life, but will mean the placing of one more trained forester of the paper industry which offers great opportunity for the practical application of forestry principles.

Mr. Porter came to the college in 1917, but soon left to become a private in the forest engineers, where he rapidly won promotion being discharged with the rank of captain, after extensive service in France.

Electric Water Heater for Utilization of Surplus Hydro-Electric Power

By H. A. WINNE
Power and Mining Engineering Department, General Electric Company

The simple and substantial electric water heater described in this article has been developed to take the place of fuel-fired water heaters in those industrial plants that are operated by isolated hydro-electric stations. As surplus electric power is ordinarily available under such conditions, the use of the electric heater will save the cost of the equivalent fuel minus the capitcl and depreciation charges on the heater.

THERE are a number of industrial plants in this and other countries which have isolated hydro-electric generating stations. In almost every one of these plants, the generating capacity exceeds the actual power requirements during the major portion of every day. Usually the water necessary to develop the surplus capacity is available during the greater portion of the year. The generating plant can be operated at full capacity at almost no increase in expense over that required to operate it at 80 per cent or 90 per cent, or whatever percentage of full capacity is required in the off-peak periods. Therefore, if this surplus or "dump" power can be used or sold, the revenue obtained from its use or sale is practically 100 per cent profit.

For industrial purposes, many of these plants require hot water or steam, and employ fuel-fired heaters or boilers to produce it. If the surplus or "dump" electric power were converted into heat, and were used for heating the water in a simple rugged heater, the cost of the amount of fuel saved, less the capital and depreciation charges on the heater, would represent a net decrease in operating expenses.

Pulp and paper mills are representative of the type of plant under consideration. These usually obtain power from individual hydro-electric plants. They require steam for drying paper and numerous other purposes, and some require hot water for washing pulp in the blowpits. An electric water heater can be utilized either to heat water for direct use in washing, or as a "temperature booster" in the boiler feed water line between the usual feed water heater and the boilers.

Description of Heater

A very simple, rugged and inexpensive electric water heater can be built of ordinary standard wrought iron pipe. Briefly, the heater consists of a length of iron pipe, through which the water to be heated flows, and through the walls of which an electric current is passed. Since iron pipe has a considerable electrical resistance, the flow of current through its walls generates heat which is transmitted to the water.

A heater designed to absorb 1000 kilowatts of three-phase power is shown in plan and elevation in Fig. 1, while Fig. 2 is a diagrammatic sketch of the complete system of water and electrical connections.

This heating consists of three sections, in multiple so far as the hydraulic connections are concerned. Each section is built up of ten lengths of 1½-inch wrought iron pipe, eight standard return bends, and one special return bend arranged for connection to busbars. These three sections are mounted side by side on asbestos lumber or other insulating supports, and are connected to the inlet and outlet headers (E) and (D). All joints between the heater pipes and bends or headers, in addition to having standard pipe threads, are arc welded to prevent any possibility of water leakage. The welding of the joints also provides good electrical contact, eliminating any possibility of overheating.

The heater is enclosed in a chamber, the walls of which are built up of heat-insulating brick, with a cover so arranged as to be readily removable for inspection. Owing to the relatively small dimensions of the complete heater this is an inexpensive method of reducing to a minimum the loss of heat due to radiation.

As shown in Fig. 2, the heater may be connected in an existing water system to "boost" the temperature with almost no disturbance of the system. The insertion of two pipe T's and the valve (A) are the only changes required in the existing piping. The inlet and outlet pipes (I) and (O) of the heater are connected one to each of the T's and have a valve in each pipe to provide a means for cutting the heater out of the system. When the heater is in use, valves (B) and (C) are open, and valve (A) is either wholly or partially closed, depending on the volume of water flowing through the main.

The circulation of water through the heater is assisted by the fact that the cold water enters at the bottom and the heated water leaves at the top.

The system of pipe connections shown applies particularly where the heater is to be used as a "temperature booster," as in a boiler feed water line or in the feed pipe to a tank supplying hot water for general purposes throughout the plant.

Flowmeter

An indicating flowmeter is connected in the inlet pipe (I) of the heater. This affords an easy means of determining the correct opening of the valve (A) to give the desired water flow through the heater.

In addition to being an indicating instrument, this flowmeter is provided with electrical contacts which open the electrical circuit whenever the flow of water decreases to a certain predetermined minimum value. The contacts are so designed that they may be easily adjusted to open the circuit at any water flow within the range of the instrument. They are connected with an auxiliary trip coil on the oil circuit breaker, in the power supply line, in such a way that when they open the oil circuit breaker will trip out. This automatic cutting off of the power, in case of reduction of water flow below a safe value, eliminates the possibility of overheating the heater.

If the flow of water through the main is not continuous and the heater is to be used intermittently, the flowmeter may be made to close the oil switch when the flow goes above the minimum safe value, as well as to trip it when the flow stops. This makes the operation of the heater entirely self-regulating.

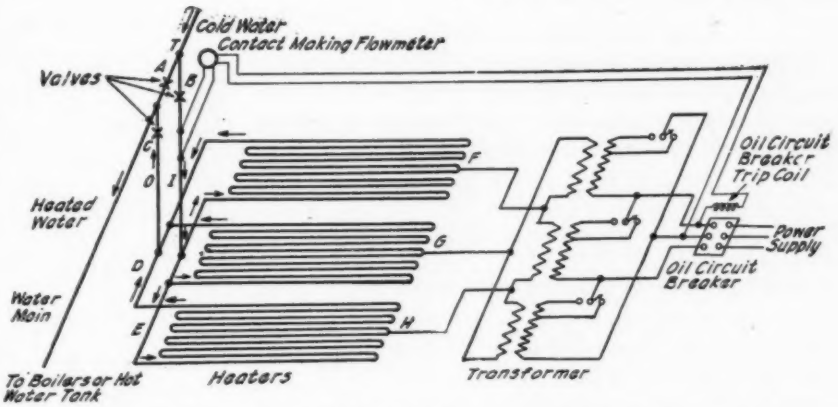


Fig. 2—Diagramatic Representation of the Hydraulic and Electrical Connections of a Pipe-type Electric Water Heater

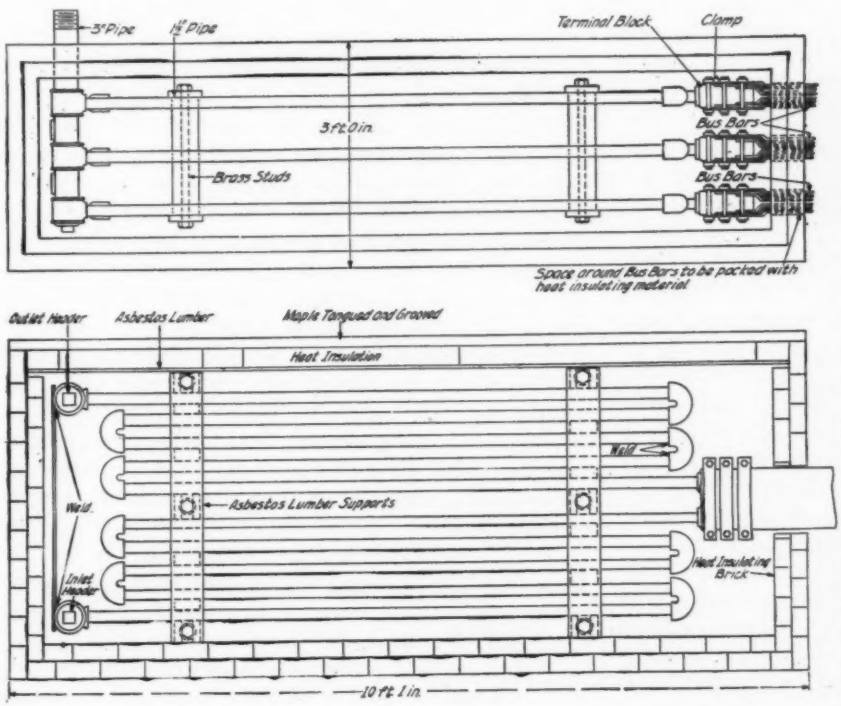


Fig. 1—Plan and Elevation of a 1000-kw. Pipe-type Electric Water Heater

Transformer and Switchboard

From the electrical line terminals (F), (G) and (H), the three heater sections constitute three electrical resistances, connected together at the ends opposite the line terminals by the headers (E) and (D). Since the three sections are similar, their resistances will be equal, and if the terminals (F), (G) and (H) are connected to a three-phase supply of suitable voltage, the power input will constitute a balanced three-phase load. Owing to the size of the pipes used, the voltage required will obviously be of a comparatively low value, and can best be obtained from a step-down transformer. On this 1000-kw. heater, 50 volts is required across the heater terminals. The step-down transformer is provided with taps for obtaining a lower secondary voltage, so that the power input can be reduced to 666 kw. when the full 1000 kw. of power is not available.

The transformer is a water-cooled three-phase unit, and occupies little floor space. Its low-voltage terminals are arranged for easy connection to the busbars leading to the terminals of the heaters.

The control equipment consists of a small panel mounting an oil switch, ammeter, watthour meter, and three double-throw disconnecting switches for changing taps on the transformer. These tap-changing switches are placed in a grille work enclos-

ure, the door of which is so interlocked with the oil switch that no manipulation of the tap switches is possible while the oil switch is closed.

The entire equipment, heater, transformer, and switchboard, occupies a floor space eight by twelve feet, and a height of nine feet.

Operating Characteristics

At first thought, it might seem that the operating power-factor of any apparatus using iron pipe to carry a heavy alternating current must necessarily be very low, but this is not the case. It is true that

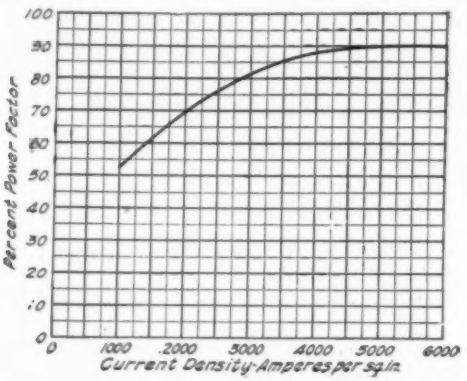


Fig. 3—Power-factor of an Iron-pipe Electric Water Heater for Various Values of Current Density in the Pipe

at current densities of the usual magnitude the ratio of reactance drop to resistance drop is high, with a consequently low power-factor. However, as the current density is increased the increase in resistance drop is at least as great as the increase in current density, and usually greater, owing to the increase in temperature and consequent increase in resistance of the conductor.

The reactance drop, however, does not increase in proportion to the current density, for the reason that the iron gradually becomes magnetically saturated as the current density is increased. Therefore, as the current density is increased, the ratio of reactance drop to resistance drop gradually decreases, with a consequent increase in power-factor.

This effect is well brought out by the curve in Fig. 3. This curve is plotted from actual test results on a pipe type water heater, operating on a 40-cycle circuit. The heater is designed to operate at current densities high enough to take full advantage of the foregoing characteristic, with the result that a power-factor of 90 per cent is obtained on a 40-cycle circuit. On a 60-cycle circuit, a power-factor of at least 80 per cent would be realized, while, of course, on 25 cycles the power-factor would be well above 90 per cent.

The operating efficiency of the equipment depends of course on the difference in temperature between the heater and the air of the room in which it is installed, the efficiency of the heat insulating inclosure, and the losses in the step-down transformer. Under average conditions the overall efficiency, including transformer losses, should always be greater than 90 per cent.

Economics

The saving that can be effected by the utilization of "dump" electric power to heat water that would otherwise have to be heated by purchased fuel, is in most cases sufficient to make the installation of a heater of the described type well worth while.

For example, we will consider the case of a certain paper mill. This particular mill has a hydro-electric generating plant having a total capacity of 6750 kw. The peak load on the plant at present is about 7200 kw., this peak lasting about two hours. During fifteen hours of the day, the plant operates at an output at least 1000 kw. below its capacity, and during six additional hours, at least 666 kw. below capacity.

The paper mill operates five and one-half days a week. Water is available for operating the plant at full capacity during thirty weeks of every year.

Calculating the total kw. hours of "dump" power available in one year, we have the following:

Per day

1000 kw. for 15 hours = 15,000 kw-hr.
666 kw. for 6 hours = 3,996 kw-hr.

Total per day = 18,996 kw-hr.
Per week 5.5 × 18,996 = 104,478 kw-hr.
Per year 30 × 104,478 = 3,134,340 kw-hr.

One kw-hr. is equivalent to 3412 British thermal units. Assuming that the electric heater operates at 90 per cent efficiency, a figure which will be exceeded in practice, we have as the total number of B. t. u. delivered to the water by the above amount of power:

$$3{,}134{,}340 \times 3412 \times 0.90 = 9{,}625{,}000{,}000$$

B. t. u. per year.

To determine the amount of coal that this amount of electrically generated heat will save, we will assume that the coal used has a calorific value of 14,000 B. t. u. per pound, and that it is burned under a boiler at an efficiency of 70 per cent. Then, the useful heat generated by the combustion of one pound of coal is

$$14{,}000 \times 0.70 = 9{,}800 \text{ B. t. u.}$$

Therefore the total number of pounds of coal saved per year will be

$$\frac{9{,}625{,}000{,}000}{9{,}800} = 981{,}000 \text{ pounds or } 490 \text{ tons.}$$

With coal at $6.00 per ton, the saving in cost of coal will be $6 \times 490 = \$2{,}940$ annually.

If sufficient water power were available so that the heater could be operated throughout the entire year on the outlined daily duty cycle, the annual saving in cost of coal would be $5096; while if the heater could be operated at full load during the entire time of operation of the mill throughout the year, the saving would be $6430.

The first cost of a 100-kw. heater, installed complete, includes transformer, switchboard, and all

Continued on page 610

How to Prevent Generator and Motor Troubles in Paper and Pulp Mills

By WM. D. KURZ

WE have to-day two kinds of current used for power work, known as alternating and direct current. The direct-current is almost obsolete for power installations, although still used for street railway work. The current commonly used in paper and pulp mills is known as A. C. or alternating current, and the voltage employed is 110, 220 or 440, three phase, 60 cycle. This last named current shall be known as standard, as it is now furnished by most all modern central stations. For this reason, I will talk about A. C. generators and motors.

First, one of the most common troubles with motors is moisture or acid fumes, as water and motors will not mix. I have discovered an occasional drop of water falling on motor laminations will penetrate the winding and result in a burned out motor. Motors in such cases should be protected with a proper housing or located in a dry place.

Second, worn motor or generator bearings, sometimes caused by tight belts or improper oiling—that is, the oil rings not revolving. In some cases, the oil holes become clogged in bottom of bearing, thus causing the oil to be drawn out of the well, or a high air pressure used for blowing dirt and dust out of motors will cause the oil to be thrown out of oil wells, and a slow leak in the oil gauge or piping will drain the well. A poor grade of oil will cause bearing trouble.

I will call particular attention to the motor or generator bearings, as I believe at least 60 per cent of trouble or burnouts are caused by the bearings, directly or indirectly. The writer was connected with a large electrical repair shop for a great many years and talks from experience.

All roters on generators and motors should be gauged up at least once a month, to learn if the air gap is equal all around, as should the roter rub on stator. It invariably results in burning out the motor or generator winding.

Causes of Shutdowns of Induction Motors

Sometimes there is trouble from blowing fuses, or possibly and more serious the fuses do not blow, but the motor, perhaps humming loudly, comes to a standstill. Under these conditions the current may be ten times normal, so that the heating effect being increased as the square of the current or 100 fold, that causes the machine to burn out its insulation. Since the torque or turning of an induction motor is proportional to the square of the applied voltage (one-half voltage produces only one-quarter torque) it is very evident that lowering the voltage has a decided effect on the ability of motor to carry the load, and may be the cause of its stopping. Another cause may be that the load on the motor is more than equal to its maximum output.

Low Torque While Starting Induction Motors

Although the circuit to motor be closed, sometimes it does not start. The same general laws of voltage, etc., apply to the motor at starting as when running. Hence, the points mentioned under "shutdowns" should be investigated, and, if necessary, corrected. The resistance, which is frequently inserted in the armature, may be short circuited, thus giving a low starting torque. Unless a starting compensator is used for starting, it is necessary, in order to obtain a proper starting torque with a reasonable current, that a resistance be inserted in rotor circuit. The resistance not only limits the current, which would, with the motor standing still, be large, but it causes the current of the armature to assume a more effective phase relation, so that with the same current a far larger torque is obtained. A partial or complete short circuit of the resistance partially or wholly ruins the starting torque.

Induction Motor Collector Ring Troubles

It is very essential that the contact of the brushes on collector rings are good, else the contact resistance will be so great as to slow the motor down and to cause heating of the collector ring itself. This effect is particularly noticeable when carbon brushes are used, as the contact resistance of a carbon brush under normal operation pressure and carrying its usual density of current (40 amperes per square inch) is .04 ohm per square inch. This under normal conditions, the drop is .04x40, which equals 1.6 volts. If the contact is only ¼ the surface, this drop would be 6.4 volts, and might materially affect the speed of the motor. Thus if the speed below synchronous speed is more than it should be, (normally it should not be over 4 per cent below) an investigation of the fit of the brush upon the collector may show up the trouble. If copper brushes are used, this trouble is much less liable to occur, since the drop of voltage, due to contact resistance when running at normal density (150 amperes per square inch) is only one-tenth that of carbon. The same trouble may occur due to the pig tail, which is usually used with carbon

brushes, making poor contact with the carbon, which produces the same effect as a poor contact with the collector itself.

The Power Factor

The Power Factor is very important in a central station or private power plant. To go into details on this subject would require more space than the whole article written above; therefore, it is very important to know if the power factor of your plant is 50 per cent or 80 per cent. A low power factor will cut down the capacity of your generator, and materially affect the entire generating system. Should trouble occur with your motors or generators call in an electrical expert who knows, or some firm that rewinds motors; do not guess at the trouble.

Testing Tearing Strength of Paper

By ARMEN ELMENDORF, M.Sc., M.E.

Presented at the annual meeting of the Technical Association of the Pulp and Paper Industry on April 14, 1920, at the Waldorf-Astoria Hotel, New York

A STRENGTH test, no matter on what material it may be conducted, may be defined as an investigation formed for the purpose of determining the relative merit of a particular material in comparison with competitive materials for withstanding such forces or conditions which tend to disrupt or destroy the material. In the case of steel or wood, failure may take place in a variety of ways, as by compression, by tension, or by shearing. In the vast majority of cases, the failure of paper, on the other hand, takes place in only one way, namely, by tearing. It is for this reason that the experienced buyer when passing judgment upon paper will take a sample of the material and tear it by hand. While it cannot be contended that the tearing resistance of paper is its only important property, it is, nevertheless, true that for a variety of purposes for which paper is used, as, for example, in wrapping packages, and for paper bags and sacks, its tearing resistance is the best criterion of its suitability for these purposes.

Fig. 1

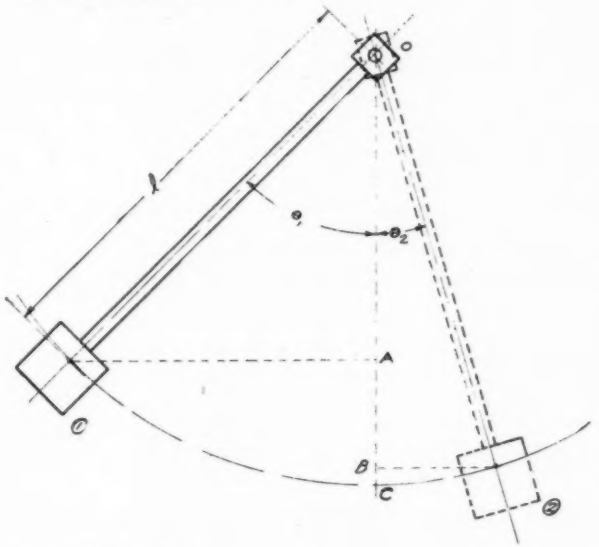
Realizing the importance of a knowledge of the tearing resistance of paper, a number of investigators have developed machines for determining this property. The purpose of all machines is the elimination of the so-called "personal equation." An experienced buyer may tear a sample of paper with his fingers, and determine its value with considerable precision. The seller may also be very confident as to his ability in passing judgment upon the strength of paper, yet the two persons may disagree. Testing the strength by means of a machine eliminates this factor entirely, and enables the consumer to select his paper on the basis of strength figures obtained mechanically. In this case, it is simply a matter of comparing the magnitude of the tearing strength figure for one paper with that for another. By means of such data, the manufacturer may also control or develop the quality of his paper by modifications in the process of manufacture. Paper may be bought or sold according to definite specifications.

While the need for an instrument for the tearing strength of paper has long been recognized, no such instrument has been developed to date which gives complete satisfaction. The difficulties encountered in determining the tearing resistance of paper were shown by Sidney D. Wells* to be as follows:

(1) The tearing resistance of paper varies greatly in different parts of the sheet, and any device that would apply a varying load by means of a spring, a pendulum, or other arrangement may possess so

*Paper presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, New York, February 6, 1919.

much inertia that after the tear had passed a strong spot, the momentum of the load would carry it through the adjoining weaker area without registering the strength thereof.



d = Length of tear
l = Distance from axis to center of gravity of Pendulum
W = Weight of Pendulum
Potential energy of pendulum in position ① = lW - lW cos θ1
Potential energy of pendulum in position ② = lW - lW cos θ2
Energy consumed is equal to the difference = lW (cos θ2 - cos θ1)
Average tearing force = $lW\frac{(\cos\theta_2 - \cos\theta_1)}{d}$

Fig. 2

(2) The variation of paper is such that it seemed to be necessary to use an integrating attachment to measure work rather than force, and the consequent complications with the probable expense necessary to develop and manufacture such an instrument discouraged further work.

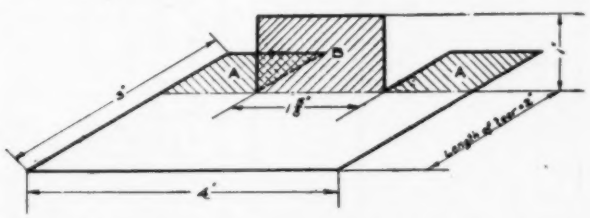
(3) The force required to tear a sheet of paper is so small that irregularities in the action of most types of instruments tried caused an error which amounted to a considerable percent of the total force, and vitiated the value of the results.

Mechanical Principle

In the instrument designed by the author and built by the Forest Products Laboratory, U. S. Forest Service, the endeavor was made to overcome each of the difficulties mentioned by Mr. Wells. The fundamental idea underlying the operation of the machine lies in the fact that the tearing force is not measured directly, but is determined indirectly by means of the work required to tear a sheet of paper. From the relation existing between work, length of tear, and force, the tearing force is determined. The elementary principle of mechanics that work is equal to the product of force times distance is used. If, for example, an average force of ½lb is required to tear a sheet of paper, and the length of the tear is equal to 3 inches, then the work done in tearing is equal to 1½-inch-lb. Or, vice versa, if the work done is 1½ inch-pounds, and the length of the tear is 3 inches, then the average tearing force is ½lb. The latter procedure is followed in the author's instrument.

A second well-known principle of mechanics, that energy may be converted into work, is also utilized in the instrument. How this is done in the tearing test may be seen by referring to Fig 2, which shows the operation of the machine in diagramatic form. The test specimen, which is shown in Fig 3, is held fast to the base of the testing machine over the two lips indicated, and a paper clip holds the central strip, which is torn out in two places, each tear being two inches long. A cord to which the paper clip is attached passes over a pulley. The end in turn is fastened to this pulley. When the pendulum which is initially raised to the left is allowed to fall, it turns the pulley and raises the clip, thereby tearing out the strip of paper. The potential energy stored in the pendulum when at the left of the vertical is given by the product of its weight and the distance through which the center of gravity has been raised vertically. Its energy on the right of the vertical after the paper strip has been torn is also represented by the product of the weight and the distance through which the center of gravity has been raised. The latter energy is less than the former, due to the work done in tearing the paper. The difference between these two quantities, therefore, represents the amount of energy consumed in tearing the paper, that is the work done. Dividing the work done by the length of the tear yields the average tearing strength during the entire tear.

The initial angle is the same for all tests, the pendulum being swung through an angle of 70 degrees. It is held by a pin in this position. The length of the tear is constant for all test specimens. In order to determine the tearing strength of a certain sample of paper, it is only necessary to hold the test specimen in clamps, and to read the final angle or the angle



after the tear has been made. By referring to the table, a section of which is given in Fig. 4, the force corresponding to the weight used and the angle read on the instrument is given directly in .01lb. By suitable calibration of the arc on the testing instrument it may be made to yield the tearing force directly.

Makes Accurate and Rapid Test

It is apparent from the operation of the instrument that the effect of the speed of testing has been eliminated, inasmuch as the force of gravity operates the pendulum, and no hand wheel or crank manip-

TABLE I.

Log of Strength Tests of Various Paper.

No.	Paper	Weight per ream 24x36 500 basis	Per cent rel. humid.	Temp.	Mullen test	Points per lb.	Ave. Break. length	Ave. fold. test	Ave. stretch	Tearing strength in mach. direction	Tearing strength across mach. direction	Ave. tearing strength per lb. in machine direction
			Per cent	°F	Lbs.		Meters	No.	Per cent	.01 lbs.	.01 lbs.	
1	Amber flat,45% cotton hull fibre,55% sulphite pulp	59.0	66	76	23.0	0.389	3200	30.9	2.79	44.2	------	0.75
2	Amber flat,50% rag, 50% sulphite	56.0	66	76	19.5	0.348	2859	16.2	3.4	35.0	------	0.63
3	Special ledger,50% cot. hull fibre,50% sulphite	57.0	65	73	22.3	0.391	3254	13.9	3.5	37.2	------	0.65
4	Special ledger,50% rag, 50% sulphite	52.5	64	74	23.1	0.440	3668	33.3	3.5	39.0	------	0.74
5	Commercial paper,75% cot. hull fibre,25% sulphite	48.0	65	72	11.8	0.245	2426	8.1	2.8	33.3	------	0.69
6	Commercial paper,50% cot. hull fibre,50% sulphite	46.0	66	71	13.8	0.300	3262	7.5	2.28	29.0	------	0.63
7	Black willow sulphite, cook 378	57.1	68	71	20.0	0.350	3933	14.8	1.66	35.3	38.9	0.62
8	Bald cypress, sulphite, cook 379	53.8	67	71	24.8	0.460	3430	186.2	2.59	56.9	54.8	1.06
9	Unfinished wedding, 100% cot. hull fibre	73.0	65	80	18.1	0.248	2233	6.7	2.30	52.4	------	0.72
10	Finished wedding, 100% cotton hull fibre	71.0	64	79	18.4	0.259	2206	10.7	2.56	48.8	------	0.69
11	Commercial kraft 30#	28.0	62	--	21.6	0.772	4460	148.0	2.17	34.9	------	1.25
12	Commercial kraft 40#	40.6	66	--	24.4	0.600	3935	191.0	2.80	59.4	------	1.46
13	Commercial kraft 50#	50.0	62	--	36.4	0.728	4465	361.0	1.74	78.9	106.5	1.58
14	Commercial kraft 40#	43.7	67	--	42.0	0.962	6258	1008.0	3.50	78.7	------	1.80
15	Commercial kraft 25#	28.1	62	--	25.8	0.918	5700	597.0	4.00	34.1	47.0	1.21
16	Commercial kraft 30#	33.4	61	--	32.4	0.970	5612	460.0	3.80	44.4	70.2	1.33
17	Commercial kraft 40#	44.8	64	--	45.8	1.020	6178	1221.0	4.12	60.6	71.5	1.36
18	Commercial kraft 50#	54.2	63	--	56.4	1.040	5948	976.0	3.73	97.5	81.6	1.80
19	Commercial kraft 90#	99.0		--	97.0	0.980	5800	3715.0	3.65	196.8	------	1.99
20	Commercial kraft 40#	42.7	67	--	43.6	1.020	6670	3023.0	3.60	73.2	87.2	1.71
21	Commercial kraft 50#	45.8	64	--	50.0	1.090	6660	3699.0	2.92	81.1	------	1.77
22	Commercial kraft 33#	33.3	62	--	31.0	0.933	5445	526.0	3.34	39.1	------	1.17
23	Commercial kraft 40#	42.7	64	--	27.6	0.647	4640	457.0	2.15	80.0	86.0	1.87
24	Kraft, Longleaf pine, cook 237	31.0	--	--	35.6	1.150	----	-----	----		53.8	
25	White spruce,sulphate	38.0	67	70	19.0	0.500	5690	1110.0	1.73	39.2	------	1.03
26	White spruce,sulphate	38.5	68	69	28.0	0.730	6070	1061.0	1.88	41.2	41.8	1.07
27	Spruce ground wood, news, grinder run No. 143	33.0	--	--	14.8	0.448	3593	------	1.83	8.6	13.7	0.26
28	Flax tow, cook No. 2, soda	59.5			42.7	0.720	5680	1838.0	4.72	114.1	106.5	1.92
29	Flax tow, cook No. 5 , sulphate	56.6			42.9	0.760	6215	1243.0	4.62	79.0	70.8	1.40
30	Flax tow, cook No. 6, sulphate	53.0			34.3	0.650	5875	1318.0	4.60	44.0		0.83
31	Flax tow, cook No. 7, sulphate	45.8			28.2	0.620	4835	1724.0	3.88	82.0	81.1	1.79
32	Commercial, All linen bank note	50.0			52.0	1.040	6360	3562.0	7.42	60.3	73.9	1.20

TEARING FORCE

Average tearing force in 0.01 pounds per sheet torn along two lines. Three sheets torn simultaneously. Length of tear 2 inches. For use with the Elmendorf paper tearing testing machine.

Initial angle 70 degrees.

Angle	Weight						Angle	Weight					
	1	2	3	4	5	6		1	2	3	4	5	6
Degrees	Pounds						Degrees	Pounds					
35.0	157.1	130.5	103.4	82.9	44.6	32.0	40.0	139.6	116.0	91.9	73.6	39.6	28.4
.1	156.8	130.2	103.2	82.7	44.5	31.9	.1	139.3	115.6	91.6	73.5	39.5	28.3
.2	156.5	129.9	102.9	82.5	44.4	31.8	.2	138.9	115.3	91.4	73.3	39.4	28.3
.3	156.1	129.6	102.7	82.4	44.3	31.8	.3	138.5	115.0	91.2	73.1	39.3	28.2
.4	155.8	129.3	102.5	82.2	44.2	31.7	.4	138.1	114.7	90.9	72.9	39.2	28.1
.5	155.5	129.1	102.3	82.0	44.1	31.6	.5	137.8	114.4	90.7	72.7	39.1	28.0
.6	155.1	128.8	102.1	81.8	44.0	31.6	.6	137.4	114.1	90.4	72.5	39.0	28.0
.7	154.8	128.5	101.9	81.7	44.0	31.5	.7	137.0	113.8	90.2	72.3	38.9	27.9
.8	154.5	128.2	101.6	81.5	43.9	31.4	.8	136.7	113.5	89.9	72.1	38.8	27.8
.9	154.1	128.0	101.4	81.3	43.8	31.4	.9	136.3	113.2	89.7	71.9	38.7	27.7
36.0	153.8	127.7	101.2	81.1	43.7	31.3	41.0	135.9	112.8	89.4	71.7	38.6	27.7
.1	153.5	127.4	101.0	80.9	43.6	31.2	.1	135.5	112.5	89.2	71.5	38.5	27.6
.2	153.1	127.1	100.8	80.8	43.5	31.2	.2	135.1	112.2	88.9	71.3	38.4	27.5
.3	152.8	126.8	100.5	80.6	43.4	31.1	.3	134.8	111.9	88.7	71.1	38.3	27.4
.4	152.4	126.6	100.3	80.4	43.3	31.0	.4	134.4	111.6	88.4	70.9	38.2	27.3
.5	152.1	126.3	100.1	80.2	43.2	30.9	.5	134.0	111.3	88.2	70.7	38.1	27.3
.6	151.7	126.0	99.8	80.0	43.1	30.9	.6	133.6	110.9	87.9	70.5	37.9	27.2
.7	151.4	125.7	99.6	79.9	43.0	30.8	.7	133.2	110.6	87.7	70.3	37.8	27.1
.8	151.0	125.4	99.4	79.7	42.9	30.7	.8	132.9	110.3	87.4	70.1	37.7	27.0
.9	150.7	125.1	99.2	79.5	42.8	30.7	.9	132.5	110.0	87.2	69.9	37.6	27.0

Fig. 4

ulated by a person is used. The test is rapid, for it is only a matter of clipping the specimen in place and allowing the pendulum to swing. A light pointer is moved as the pulley turns, and remains in the position of the maximum angle to which the pendulum turns after the tear has been completed. Several sheets of paper are usually torn together, so that an average value may be readily obtained. Although the force required to tear each individual sheet is not affected by the number of sheets used, it has been found most practical to tear three sheets at one time. In order to get a good average value of the tearing force, it is best to select the test specimens from various places in the larger sheet of paper, preferably using five sets of three specimens of each. By using two specimens of each kind, it is also possible to determine the average of the machine-direction and across-the-machine-direction tearing strength values simultaneously. In the case of heavy paper, individual sheets may be torn.

Contrary to the usual observation made in determining the tearing strength of paper the values obtained with the instrument under consideration are very uniform. When tested in groups of five, the average variations of an individual strength value from the average strength is found, in general, to be only about 3 or 4 per cent. Extensive tests were made to determine the effect of using weights of different magnitudes. It was found, however, that no variation in the tearing strength was obtained over the range of weights with which the machine is equipped.

Numerous tests were made at the Forest Products Laboratory upon representative commercial papers and papers of various grades and types made experimentally. These tests were made with the instrument shown in Fig 1. The results of the tests are

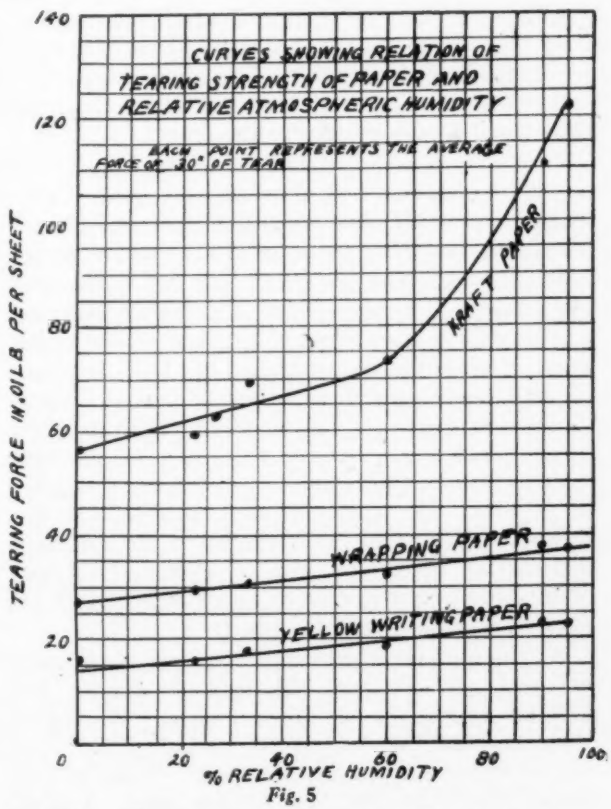


Fig. 5

given in Table 1. They were all conducted under standard conditions, namely, at 65 per cent relative humidity and approximately 70° Fahr. temperature. The results of the "pop" test, the tensile test, folding test, are also included in the table, as well as the stretch and the weight. It will be noted that the tearing strength across the machine direction is usually appreciably higher than the strength when the tearing is made in the machine direction. The tearing strength per pound also increases with the weight of the paper.

Figure 5 shows the relation between the tearing strength of three grades of paper and the pervading atmospheric humidity. While the tearing strength increases with the atmospheric humidity in all cases, the change in strength is most pronounced in the case of the kraft wrapping paper, for which the tearing strength at 95 per cent relative humidity was about twice that at very low humidities. This is undoubtedly due to the greater toughness resulting from improved cohesion between the fibres at higher moisture contents.

Ideas Under a Bushel

By W. F. SCHAPHORST, M. E.

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FOR some reason or other, the natural tendency seems to be "keep mum about trade kinks." When a work, foreman, or anyone else discovers an easier way to do something, he hastily looks around to see whether or not anybody saw him do it in the newer or better way. He thinks to himself, "This kink is too valuable to reveal to others. I'll keep it to myself, and it may help me some time." He, therefore, keeps it to himself. He does the work the "old" way because the "new" way is his secret, and he fears somebody will steal his idea from him. The longer he keeps it the more valuable it seems to him. He never lets go of it, and perhaps lives to see someone else discover the same trick. The "other fellow" tells about it in the technical or trade papers and forges rapidly to the front.

Ideas are valuable, true enough; but they are of no value whatsoever if they are not used. If an idea is good and is patentable, and seems to be worth patenting, the thing to do is to take out a patent.

Many ideas that are good are not patentable. For example, in many plants time and energy are lost blowing dust and lint out of machines with hand fans. That is the way it always has been done, and for that reason, the foreman thinks that is the way it must be done. A girl who had to do the work in one plant suggested one hot day that the foreman furnish her with an electric fan for doing the same work. He "tumbled" and furnished the fan. It worked nicely, did the work better, more quickly, and did not cause the girl to overexert herself. Many little improvements of this simple nature are possible in and around the plant.

A friend of mine explained it to me in this way not long ago. He said, "Let us trade dimes. You give me a dime for one of my dimes." We traded. Then he said, "We haven't progressed a bit. You are no richer than you were before." I agreed with him. "Now," he said, "Let's trade ideas. You tell me how to rearrange my belting system to save power and I'll tell you how money can be saved on lubricants." I agreed, and we traded ideas. He then showed me that we were both richer in ideas. The progressive man isn't afraid to tell what he knows or ask questions about what he doesn't know. He doesn't keep his candle under a bushel.

What Is Formula for Inefficiency?

I read a statement worded something like this the other day: "80 per cent efficient means 25 per cent inefficient." Is that correct?

We are generally in the habit of thinking that 80 per cent efficient means 20 per cent inefficient. We simply subtract 80 from 100. The writer of the above statement evidently desires to show us that we are wrong, and that wastage is greater than we suppose. His formula seems to be

$$\text{Inefficiency} = \frac{100 - \text{efficiency}}{\text{Efficiency}}$$

But let us see. Let us substitute an efficiency of 50 per cent in his formula. We then get

$$\frac{100 - 50}{50} = 100 \text{ per cent inefficiency}$$

Now, 100 per cent inefficient, I should say, means that "all is lost," and that the efficiency is zero instead of 50 per cent. It is true that where boiler efficiency is 50 per cent, for example, just as much heat is lost as is utilized. The amount of fuel burned is twice as great as it would be with 100 per cent efficiency. Or, if 100 per cent efficiency were possible, the fuel bill would be cut in half.

I conclude, therefore, that the writer of the above statement was a wee bit too eager to point out the seriousness of losses. He tried to make them look as big as possible via the mathematical route. In an extreme case, where the efficiency is 1 per cent, his method would give

$$\frac{100 - 1}{1} = 9{,}900 \text{ per cent inefficiency}$$

In my mind, the logical formula for inefficiency (if inefficiency can be stated as a percentage) is:

$$100 - \text{efficiency} = \text{per cent inefficiency.}$$

Handling and Costing Raw Materials in the Manufacture of Paper

F. C. CLARK, M. M. KILEY AND H. R. HARRIGAN
American Writing Paper Company

Presented at the Joint Meeting of the Local Branches of the Cost Association and the Technical Association of the Pulp and Paper Industry on Monday Evening, January 19, 1920, at Holyoke, Mass.

The following, by H. R. Harrigan, is a treatise on the subject of handling pulp and is the third installment of this article. The two former installments, by F. C. Clark and M. M. Kiley, described the handling of rags and old papers and were published in the May and June issues.—Editor.

"MY part in this discussion is to tell how we would ascertain the cost and how we accurately measure the quantities of pulp used. This question is very simple, much simpler than that of handling rags.

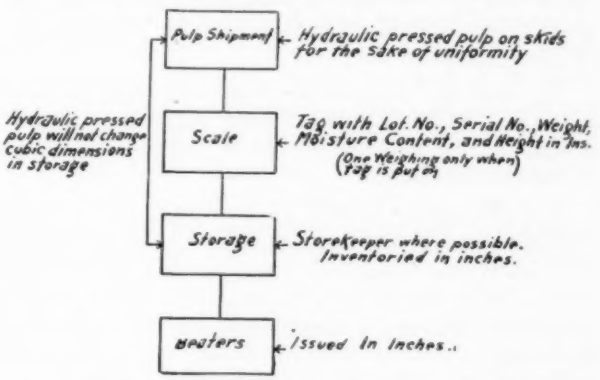
We found in our mills that there was no general practice in measuring the amount of pulp used. In some cases it was expressed in pounds, in some cases in inches, in some cases in bundles, and in some cases in skid loads.

As it is first received and sampled, the pulp will have a certain amount of moisture, part of which will dry out so that the weight should be obtained at the time of sampling. From this it will be seen that weighing the pulp into the beater cannot be very accurate. This was one reason for the discrepancies in reported consumption and actual consumption that Mr. Hutchinson spoke about.

We have found that bundles varied over 200% in weight. Rolls might weigh from 50 pounds to 150 pounds. We cannot very well use a bundle or a roll as a unit on account of this variation in weight. If a car contains a large number of bundles, it is not very practical to measure the total number of bundles in inches. This applies to rolls also.

The recommendation that we came to was to take the pulp as received on skids—we prefer skids for convenience in handling and because the pulp is wet. Wet pulp is better to handle in the beaters than pulp that has been dried, because in drying pulp there are parts of it that are made bone dry. We prefer the hydraulically pressed pulp because the moisture and cubic contents will be more uniform than when it is received off of a wet machine or a dry machine.

When a skidload of hydraulically pressed pulp is received, it should be weighed, given a serial skidload number, a lot number and tagged. A test should also be made for moisture. A further recommendation is to express on that load of pulp its height in inches, having that as a measure to divide the skid load into the furnish. It is sometimes divided into quarters or halves, in order to determine the amount that should be used in the beater. My preference is to have the height expressed in inches on the skid at the time of receiving for the reason that, if a portion of the pulp is used, another portion can be again used later on and the amount used determined. That method can also be used as a means of expressing the amount on hand when taking inventory. This is, of course,


Pulp Shipment
Hydraulic pressed pulp on skids for the sake of uniformity
Hydraulic pressed pulp will not change cubic dimensions in storage
Scale
Tag with Lot No., Serial No., Weight, Moisture Content, and Height in Ins.
(One Weighing only when) Tag is put on
Storage
Storekeeper where possible. Inventoried in inches.
Beaters
Issued in Inches.

using hydraulically pressed pulp. It is not always possible to obtain this and we have to adapt ourselves to what we can get. Today mills won't all produce pulp in this condition. The same scheme can apply to lap pulp in bundles and measured in inches.

My intention in using this method is not to weigh the pulp again, but to apply the moisture test received from the laboratory and to use that through all the subsequent operations. On the chart we have shown a scale where the pulp is weighed before going into storage. Where a mill uses large quantities of pulp, it would be well to have a storekeeper who will keep a record of the amount of pulp received and delivered to the beaters in inches.

At our company we have considered dividing a car by the number of rolls and delivering it to the beater in that way. I think the better method is to weigh a truckload of rolls as they come from the car, and divide that by the number of rolls that are on the truck, and attach an average weight to each roll. The average weight per roll will then be more accurate than to take an entire car and divide it by the number of rolls, because of the great variation existing

in the weight. I think the Cost Association is taking some action in the matter of getting pulp mills to produce more uniform units, either in rolls, laps or bundles, and I think they have accomplished something in this respect.

One of the pulp mills recently expressed great surprise that a paper mill should ever attempt to use a skid load of pulp as a unit of measure. This pulp mill is not cooperating with the paper mills in their effort to get uniform units. One of their excuses was that they could not have a sufficient number of skids to load uniformly. They also had to top off the skids with extra bundles in order to bring their car weight up to the maximum. This method of measuring in inches seems to eliminate a good deal of trouble that would come from these conditions.

Questions

Mr. Hutchinson: The Cost Association did make some recommendations along the line of getting the pulp manufacturers to produce uniform units, but I think that the most persuasive arguments to be made to pulp manufacturers can be supplied by our purchasing agents.

Mr. Harrigan's proposal in regard to a store-keeper involves using beater-room help that can multiply and divide. My observations were that we were lucky if they could write.

Mr. Harrigan: It will not be necessary to have beater-room help that can multiply and divide if the skid loads are furnished from a store-room. The store-keeper will deliver so many inches for a particular grade and keep an accurate record of the amount delivered.

Mr. Hutchinson: I believe that that is now the practice at the Woronoco mill of the Strathmore Paper Company. Is it not, Mr. Johnson?

W. O. Johnson: Not at Woronoco, no sir. We have such a method for mill supplies, but not for materials used in the furnishes.

Mr. Bush: I would like to ask Mr. Harrigan about the moisture content tag for each skid. If each skid is tagged with the moisture content, should not that tag carry the weight so that the tag can be used for a record?

Mr. Harrigan: Yes. The tag should carry the weight, moisture content, and height in inches of the pulp as received. I think in most cases the skid is divided for the reason that I first mentioned—that the skids are not uniformly loaded. They are either divided or corrected. If the store-keeper is requested to furnish a certain number of inches, the skid load unit cannot very well be used. He would furnish a new skid load and divide it up, in that way delivering the exact amount required for the furnish. The idea of expressing the amount on the tag in inches as received was to show how that skid had changed from the time of receiving and of depositing in the store-room to the time of taking inventory. I think that, while we have wide discrepancies on pulp in inventory adjustment and small ones on rags, we have great variances in rags furnished for a particular paper—greater than we do in chemical pulp as furnished.

It is not absolutely necessary to have the moisture content all through the process. The moisture content can be made a matter of mill record. The man who handles the pulp does not need to have a record of the moisture content of each particular lot.

Mr. W. O. Johnson: Does the pulp expand or contract in a pile in measuring? I believe, from Mr. Harrigan's remarks, in attempting to measure the pulp that it contracts as it dries. Lap pulp is considerably drier after it has laid around for a while than at the time of receiving.

Mr. Harrigan: My own observation is that it changes its cubic contents very little as it dries. The size does not vary greatly. The pulp as received is fairly wet; this is particularly so in the case of hydraulically pressed pulp. My recommendation was to get the pulp mills to produce that kind of pulp. It does not involve a great change in the design of the machines.

Mr. Balch: I understand that you were attempting to determine the dry content per inch in the lap, and to attach values in inches rather than in the pound basis. Am I correct?

Mr. Harrigan: Yes. The inch would be the unit rather than the bale, bundle, lap, or pound.

Mr. Balch: I was going to say that at the Chemical Paper Company we have had very good luck in weighing rolls, using the Kron Registering Scale. The rolls are taken directly from the car, put on the scale and stamped with the weight at the time. No average weight is taken.

Mr. Harrigan: If it is convenient to take the weight of a roll, it is more accurate. My recommendation on sulphite would be to try not to receive it dry in rolls. Sulphite is required for strength and drying injures it. It also injures soda pulp, but soda pulp is not as important.

Mr. Nixon: At the Chemical Paper Company, we have adopted for all lap pulps, after extensive tests, the wet pounds per inch. We now put on our furnishes the number of inches and the number of wet pounds to each inch. The superintendents determine the quantity or percentage of pulp, and, knowing the dry weight, which we have recorded from our tests on each car that comes in, it is very easy to figure the number of wet inches and the number of wet pounds. We put on both as a check for the man operating the beater. This method has worked out very well. You must train a man to use the measuring stick properly, but that applies to any method that you put in. I believe that, after extensive checks, the inch

method—that is the wet pounds per inch, is the proper way to get at it.

Joint Meetings Beneficial

At Mr. Hutchinson's request, Mr. Bush then spoke of the benefits to be obtained by both the cost men and the technical men if they work together. He stated that he was very much interested in the chart on the slush process for the handling of magazine stock. He expressed the hope that the two associations would get together more often in this manner. The Cost Association has changed its meeting night to the second Monday in the month, so that the cost men can attend the Technical Association meeting, and the Technical men can attend the Cost Association meeting.

Mr. Nixon: In regard to the slush system, I believe that's the method operating in the Gill Division. Is there anyone here from the Gill Division who can tell us how accurate the process is using the density regulator and liquid level gauge?

Mr. Magnus: We have no density regulator or liquid level gauge at the Gill Division. The methods which we use for securing a uniform furnish is to furnish our magazine stock last in the beater. We have a washing cylinder on the beater, and take out enough water to bring the furnish down to a mark in the beater. Our cost records show that we are getting quite uniform results.

Mr. Kiley: I would say that the proper way to furnish magazine stock would be to put it in first if you are to take the measurement with a measuring stick. When a liquid level gauge is to be used alone as an indicator, it could be added at any time.

Mr. Harrigan: At the Gill Division, it is customary to use two materials; chemical pulp, which is comparatively easy to measure, and magazine stock. Chemical pulp is furnished first, and magazine stock is used to make up the balance required. The Gill system is not quite as modern as some of the other mills. Some of the divisions keep the stock constantly circulating, because it can then be kept thick and heavy. It is moved about by a plunger pump. In that case it is more convenient to furnish it first.

Mr. Esty: What provision has Mr. Clark made for the moisture shrinkage in rags?

Mr. Clark: We have not made any attempt to get the moisture content on a bale of rags as received.

Mr. Esty: I have run a test and it runs about 2%.

Mr. Clark: We started in to do some work in classifying rags, but when we get into that further the question of moisture content will be considered. The moisture content in some of the bales of rags runs very high.

Mr. Barrett: I would like to ask Mr. Harrigan what his idea is in keeping a storekeeper. Would the storekeeper be responsible for reporting to the office for cost purposes, the quantities of pulp that went into the beaters?

Mr. Harrigan: In many mills, chemical pulp is the largest single item consumed. It would be the storekeeper who would deliver certain quantities of pulp for furnishing the beaters, and so it would not have to be measured by the beater-room help. The storekeeper would also keep a record and be responsible for the amount of pulp used.

Mr. Barrett: If the storekeeper is going to be responsible for that, he is going to have his hands full. Some of the pulp never sees storage. It is used as fast as it is received. In that case, would your arrangement be practical? It would be a good idea if it were practical. If pulp is furished to the beaters as soon as it is received, the storekeeper would be a pretty busy man recording receipts and deliveries. In some cases, pulp does not come in fast enough.

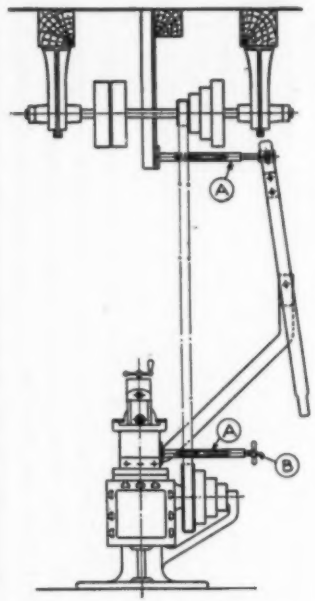
Mr. Mathieson: I do not think it would work in a fine mill. We do not know exactly how much stock is in the cars, so we furnish rags first and make up the the balance with pulp. If we furnished a constant amount of pulp each time, some of our beaters would be light and some heavy.

Mr. Yoerg: It seems to me that having the skids and rolls properly tagged and one man directly responsible would be a very good idea.

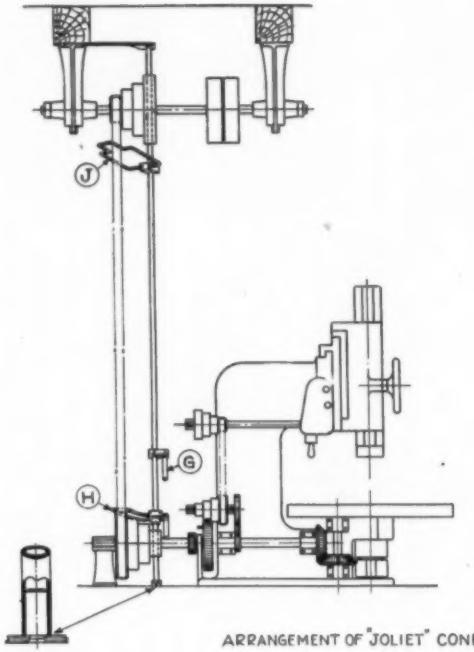
Information was then requested regarding a system similar to that of having a storekeeper as suggested by Mr. Harrigan, which had been installed in one of the local mills.

Mr. Bush: Perhaps the gentleman refers to the time that the Crocker-McElwain Company were attempting some such proposition as that: There were tour clerks, who acted as control clerks over the quantity of material that is delivered to the beaters. These clerks were located at a scale where the material was taken to the beater room. The clerks kept track of the number of loads and weighed the number of cars and anything else that happened to be going into the beater-room. We finally discovered that the tagging system which was adopted by the Chemical mill, through necessity and not through desire, was giving closer results than the tour system at the Crocker-McElwain mill. The tour system was therefore discarded and the tagging system adopted, and the records bear out the wisdom of that change. They use tags on the skids of pulp, weigh each roll of soda pulp, etc., and the men in the beater-room who cannot read or write are really taking care of those tags and giving very good results.

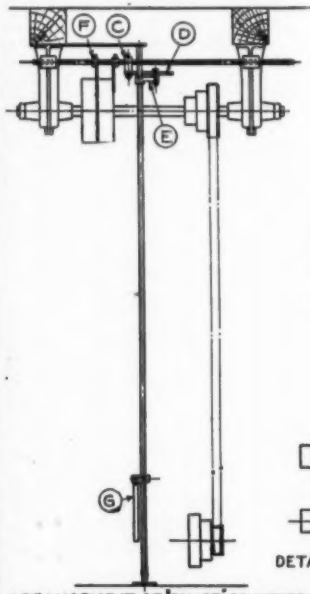
Mr. Schmidt: I would like to say that I approve of Mr. Clark's idea of using a car with a hopper bottom. The conveyor is very sloppy business. Once you put the rags into the car, you might as well weigh them, because you can push them over the floor to a scale in no time.



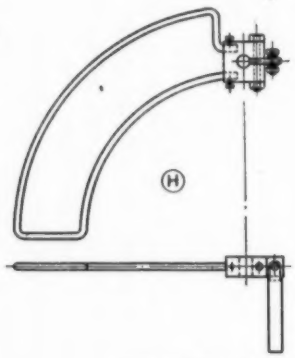
ARRANGEMENT OF "KILTS" CONE PULLEY BELT SHIFTER

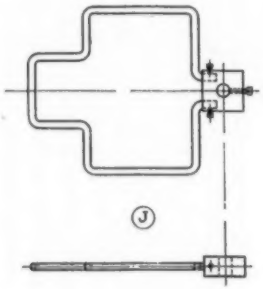


ARRANGEMENT OF "JOLIET" CONE PULLEY BELT SHIFTER

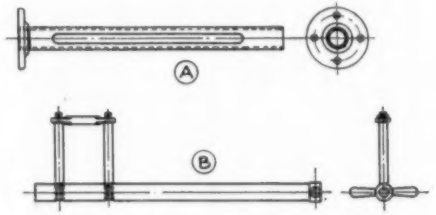


ARRANGEMENT OF "JOLIET" COUNTERSHAFT BELT SHIFTER

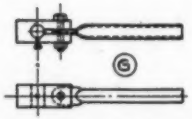




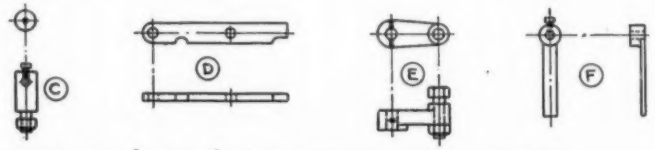
DETAILS OF "JOLIET" CONE PULLEY BELT SHIFTER



DETAILS OF "KILTS" BELT SHIFTER



DETAILS OF "JOLIET" BELT SHIFTERS



DETAILS OF "JOLIET" COUNTERSHAFT BELT SHIFTER

BELT SHIFTERS

ILLINOIS STEEL CO.

FEB. 10-1914.

-PLATE-2-

13334

Belt Shifters and Belt Shippers

Prepared by the Engineering Department of the National Safety Council

The drawings on the opposite page were made under the direction of R. J. Young, who has charge of safety work for all the plants of the Illinois Steel Company. Mr. Young is known as the "Father of the Safety Movement." Back in 1906, while in charge of the claim department of the South Works, Illinois Steel Company, he became interested in safety and two years later initiated the plan of organizing workmen's inspection committees. This placed the Steel Corporation in the position of being the great pioneer of the safety movement. Mr. Young has been generous in contributing to others the benefit of his experiences and scores of safety engineers owe their first inspiration and instruction to him.—Editor.

THE terms used in this article are explained as follows: Belt Shifter, a device for mechanically shifting a belt from tight to loose pulley or vice versa, or for shifting belt on cones of speed pulleys; Belt Shipper, a device for placing (or replacing) belts on pulleys; Shifter Pole, a pole used for shifting belt from tight to loose pulley or vice versa—this does not include bars attached to mechanical shifters; Shipper Pole, a pole designed for use in placing belts on pulleys—this does not include bars attached to mechanical shippers; Belt Perch, a bracket or similar device for suspending idle belts away from shafting, pulleys, etc.

Belt Shifters

For safety of machine operation, frequently for economy, and always for convenience, belt shifters are included in the equipment of the modern plant. In addition to the homemade shifters illustrated, several patented devices are on sale, a list of which will be furnished by the National Safety Council on request.

Rapidity and certainty in the operation of belt shifters are important. Shifters should be equipped with positive locking devices, or counterweights, to keep belt on either pulley.

Install belt shifters so that their own weight will not tend to operate them, at least not to the "on" position. Some engineers recommend that the shifter handle be placed to hang in a vertical position when the belt is on the loose pulley, to insure safety if locking device fails.

Shifters should be so located that they can be easily and quickly operated; will not interfere with machine guards; and can be easily inspected, maintained, and repaired.

Care should be taken to locate shifter handles in safe positions. If necessary to locate shifters over work places, cut handles off 6½ feet above floor level to prevent men striking them. Shifter handles should never be located over or along passageways where they are liable to be struck and accidentally moved to the running position.

The practice of shifting belts by hand is dangerous and should be prohibited.

The use of a stick or pole for shifting belts on cone pulleys is unsatisfactory and unsafe (though less dangerous than shifting the belt by hand), and the installation of a mechanical shifter is recommended.

Shifter Poles

The use of poles or pieces of pipe for shifting belts should be avoided. While this practice is less dangerous when applied to overhead belts than when applied to belts nearer the floor, a rather serious hazard is unnecessarily encountered. In all cases, mechanical shifters should be installed and used.

If shifter poles must be used, they should be of sufficient size to enable workmen to grasp them securely. (Two inch diameter or 1¼ or 1½ x 2 inch cross-section is suggested.) They should be long enough to reach from the top of the highest pulley to within about 24 inches of the floor. If shorter poles were caught in the pulley, they would likely strike and injure the abdominal organs of the employe handling them. The upper ends of poles should be equipped with prongs.

Shifter poles should be used with caution. If belt is unshipped from the counter or jack shaft pulley, the best plan is to stop shaft and replace belt.

Belt Shippers

Belt shippers are employed in the shipping and unshipping of belts to and from pulleys on line or countershafts. The better practice is to have loose pulleys (or "idlers") to make unnecessary the shipping and unshipping of belts.

Shipper Poles

Shipper poles should be of sufficient size to enable workmen to grasp them securely. (Two inch diameter or 1¼ or 1½x2 inch cross-section is suggested.) They should extend from the top of the highest pulley to within about 24 inches from the floor.

Belt Perches

Where loose pulleys or idlers are not practicable (and under certain other conditions), belt perches in the form of brackets, rollers, or other devices, should be used to keep idle belts away from shafts. Perches should be substantially made and so de-

Continued on page 598

The Manufacture of Blotting Paper

By B. K. STEADMAN, CH.

ALTHOUGH I have read numerous articles on paper and its manufacture, I do not recall a single article devoted entirely to blotting paper.

I am quite sure that there are some readers of this magazine who are not familiar with the manufacture of blotting, so an article on its manufacture should at least be of interest to them.

While the principles involved in the manufacture from raw materials, of all grades and kinds of paper, are more or less alike, there is quite a difference in the actual steps taken for making a particular kind of paper. As these general principles are already understood by most of you, I will not go into details, but will give a general outline of how blotting is actually made, from the raw material to the finished product.

Sources of Supply

Cotton rags and wood pulp are the chief sources of fibrous materials used, although cotton linters and other materials are not uncommon. There has been a lot of research done to determine the value of cotton linters for paper-making. Linters are sometimes used by this mill along with rag stock, but they have two disadvantages for making blotting paper. To begin with, the fibers are too short and the linters always arrive containing small knots of fibers. To make the best blotting papers the fibers should be long. Perhaps we could largely overcome the knotty fibers by drawing them out in the beater, but this would make them close together, thus making the blotting hard and thin. If the manufacturer of these linters could overcome this knotty appearance it would add to the value of his product.

The rags used are of various grades of cotton and range from new shirt cuttings down to soiled street rags. Most of the rags we use are "quite soiled." They are delivered at the mill in strap-iron bales, which weigh about 600 to 700 pounds. The rags are delivered in various conditions of filth and are very poorly sorted upon arrival.

While new rags are used largely in making writing paper, book paper, etc., old rags are largely used in the manufacture of blotting paper, as they are softer than new rags.

Wood Pulp

About the only wood pulp used is chemical soda pulp, or sulphite. Either bleached, or easy bleached sulphite may be used. Chemical wood is generally shipped in rolls which weigh about 130 pounds. Easy bleached sulphite comes in bundles. Chemical wood, as I have already said, is used in blotting manufacture, but by far the greater amount of blotting paper is made entirely from cotton rags.

Threshing, Sorting and Cutting

The rag bales are opened in the rag-room and the rags run through a thresher. This is a new machine with revolving arms, which removes the loose dirt, etc., from the rags. The rags are next taken to tables where women sort them by hand. The buttons, metal hooks, etc., are removed and the various grades and colors of rags thus sorted are placed separately; after being sorted the rags go through the duster and cutter. This is an electrically driven machine, which cuts the rags into small pieces, about one inch square. This machine also dusts the rags thoroughly to remove as much more dirt as possible before cooking. The rags go from the duster to an endless belt, which carries them to the boiler-room.

Cooking of Rags

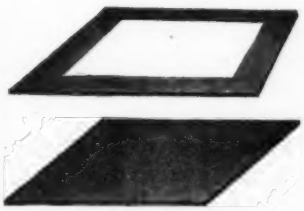
The rags are packed into large rotary boilers, which are 10 to 20 feet long and 6 to 8 feet in diameter. The boilers are cylindrical tanks made of steel, and have heads riveted on each end. Each boiler is provided with two manholes for filling. After the rags are packed into the boiler, water is introduced and the alkali added. The amount of alkali used varies and depends upon how soiled the rags are and the kind of paper to be manufactured. The rags are then cooked from 6 to 10 hours with a pressure of about 30 to 40 pounds.

There are several alkalis used in cooking rags. Caustic soda may be used; soda ash and hydrated lime may be used together; or, hydrated lime may be used alone. Soda ash and lime in water unite to form caustic soda and calcium carbonate. The latter would form a hard-like scale on the fiber. There is some difference of opinion as to which alkali is best. This, of course, depends upon several factors; the most important of which is the kind of paper to be made. For most grades of blotting I would prefer caustic soda. The alkalis have different effects upon the dirt, coloring, etc., in the rags. Caustic soda has a very energetic action and removes all of the incrusting substances, forming water-soluble soaps. It destroys the oils, fats, glues, etc. If caustic soda is used in too concentrated a solution it is liable to weaken the fiber.

Lime only partly dissolves the incrusting substances and with the starch, albumin, fats, etc., it forms water in soluble precipitates, which are almost impossible to remove from the fiber, even by washing or bleaching. Lime soap in blotting paper would, of course, lessen its absorptive power. Lime is very

Rubber Goods for the Paper Industry

Rainbow Packing



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slightly soluble in water, and is less soluble in hot than in cold water.

Washing

After the rags are cooked sufficiently and are allowed to drain, they are taken to a washer. This is an oval tub very much like the beater, which will be described later. The rags are thoroughly washed by a continuous stream of fresh water running into the washer; a rotary drum-washer covered with fine wire gauze serves to remove the dirty water from the beater. While the rags are being washed tne rolls are kept up; when they are thoroughly washed the roll is lowered and the rags cut up for half-stock. The pulp is then bleached with a solution of bleaching powder.

Bleaching powder is a mixture of calcium hypochlorite and calcium chloride. The latter serves no purpose in bleaching, but is always present. A small amount of sulphuric acid added to the washers decomposes the bleach, thus causing it to act quicker. The acid itself has no bleaching action.

Draining

The bleached pulp is run by gravity to the drainers. These are rectangular chests made of brick or concrete, and are provided with perforated bottoms to allow the water to drain out of the pulp. The pulp in the drainers is known as half-stock, and when used for paper-making it contains from 30 to 40 per cent air-dry pulp.

The Beater

As the beater is one of the most important machines we use, I will describe it briefly: A 1,000-pound beater is an oval tub 15 to 20 feet long and 3 feet deep, having a partititon called the "mid-feather," which extends along the middle of the beater, about two-thirds of its length. On one side of the "mid-feather" is a roll which extends one-half of the width of the tub.

On the circumference of the roll is a number of knives. The floor behind the roll is curved upwards and the highest point is immediately behind the roll. From this point the floor falls away to the same level as the rest of the tub. There is a "bed-plate" under the roll, which is fitted with stationary knives similar to those on the roll. When the roll is revolving, the pulp, etc., is drawn in between it and the "bed-plate," and the fibers are then torn apart. The pulp then passes over the back-fall and then through the passage on the other side of the "mid-feather" and again to the front of the roll.

In making blotting, the beating is done very differently from beating of writing paper, etc., and this step has to be very carefully guarded to insure a good absorbent blotting paper.

Dyeing of Pulp

The most difficult step of all is the dyeing of the paper in the beaters. While sizing, which is used in almost all grades of paper, helps to precipitate the color on the fibers, it cannot be used in the manufacture of blotting, as it would lessen its absorbtive value—an exception is starch. This added in proper amounts does not injure the paper, but really helps it. A small amount of clay is not injurious, and is often used. It affords weight, body and evenness to the paper.

The general procedure of dyeing in the beater is to add the half-stock first, and then the chemical wood—when this is used. After the wood is beaten sufficiently, the dye and clay are added. In some cases, the clay is added after the dyestuffs, but it is generally added first. After the pulp is thoroughly dyed, it is run by gravity into the beater-chest. This is a large wooden cylindrical churn with revolving arms. The chest serves as a reservoir for the dyed pulp.

From the beater-chest, the dyed pulp is pumped to the Jordan, or refining engine, which puts a finishing touch to the stock after it leaves the beaters. This engine further separates the fibers and cuts them very uniformly. The pulp goes from here to the machine-chest and from here it goes to the stuff box, then to the sand boxes, and from here it goes through the screen which separates small pieces of metal, etc., from the pulp, and catches small pieces of pulp, dirt, etc. The screened pulp then goes to the Fourdrinier machine, where it is made into blotting paper.

As blotting paper does not receive a high finish, it is calendered very lightly, except in certain specified grades, where a high finish is required.

Conclusion

While most papers are closely felted and contain sizing, blotting paper is loosely felted and seldom contains any size, as this would lessen its aborbency.

A small amount of filler does not affect blotting paper, and is beneficial in many respects.

Blotting paper is used chiefly as an absorbent, and it is being used more and more for advertising, especially in the form of desk blotters. It is also used in botanical laboratories, in dry batteries, for packing surgical instruments, for lining fancy soap boxes and many other purposes.

Coal Waste Due to Air Leakage in Boiler Setting

Air leakages are common occurrences in boiler settings on account of expansion and contraction of the brickwork. Coal is burned to heat this cold air drawn into the setting. Inspection of setting should be made occasionally with a lighted candle, the flame of which, due to draft, will show places where such leakage exists. Certain compounds are available in the market, which, when applied to the outside of the setting, due to their elastic and adhesive qualities, will expand and contract with the setting and prevent air leakage. Painting, with some good grade of asphalt, is often of benefit.

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Revolution in Paper-Machine Drive

Sectional Individual Motor Drive for Paper Machines

By STEPHEN A. STAEGE
Westinghouse Electric & Manufacturing Company,

Presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, on April 14, 1920, at the Waldorf-Astoria Hotel, New York

ONE of the subjects to which comparatively little attention has been given at the regular meetings of the Technical Association, yet one which is most deserving, is the subject of per-machine drive, particularly with respect to the use of individual motors for each section of the variable speed line.

Paper-machine drive has received more or less serious consideration by the paper industry and by the electrical manufacturers, but as is well known, until very recently little improvement had been made in the method or system of drive, except for the development of electrical means of obtaining variable speeds over any range desired with automatic control. In all other respects, the present mechanical systems of drive are essentially the same as have been employed for many years. To be sure, several modifications and small improvements have been made with a view to the elimination of the annoying and expensive bevel gears, spur gears, and friction clutches, but which has resulted in a multiplicity of belt and rope drives and has brought us very little nearer the solution of the problem.

The paper industry was early to recognize the value of the use of electric power in manufacturing operations and has very generally adopted motor drive in most parts of the mill, the paper machines being the one place where individual motor drive has not generally supplanted the older systems of engine, or motor group drive, and moreover, it is the one place where there is less to be said for group drive than in almost any other application. It is not because of any disinclination on the part of the paper industry to accept individual motor drive, that the old mechanical systems have been so long continued in use, but because of the inability of the electrical apparatus heretofore available to meet the exacting speed regulation requirements of sectional individual motor drive.

Disadvantages of the Mechanical System

Although we are all familiar with the various objectionable features of the old system of mechanical drive with its attendant annoyances, it may be well to review briefly some of the more important of the disadvantages of the mechanical system. In the first place, considerable space is required for the long line shaft with its numerous cone pulleys and vertical belt drives, usually the entire basement being occupied for this purpose, and in addition considerable space is required back of the machine for the transmission system there, including the cone pulleys, friction clutches, bevel gears, etc. In the transmission between the motor or engine driving the variable speed line of the machine to the machine itself there is a very large power loss, varying somewhat, of course, on different machines, but averaging approximately 50 percent of the total power delivered by the motor, which item itself is of considerable moment, especially in the drive of a large, high-speed news machine. On account of the large number of bevel gears, belts, pulleys, clutches, shafts and bearings that have to be maintained and kept in running order, there is usually exceedingly high maintenance in connection with every paper machine, the belt item and gears alone frequently running into many thousands of dollars annually. In addition to the cost of belts, gears and mechanical parts, which actually have to be renewed, a large amount of labor is also required, not only to be on hand in case of accident to make quick repairs, but to rebuild equipment after it has been taken off for repairs.

Among other disadvantages of mechanical transmission may be mentioned the noise and vibration of the gears, the hazard to employees coming in close proximity to gears, belts, shafting, etc.; the fire hazard occasioned by the large number of bearings, which, if not given proper attention, may become hot, igniting the oil; the large amount of oil required for the lubrication of so much shafting and bearings; the high first cost of the mechanical drive including the line shaft; the lack of flexibility and the considerable investment in spare parts that has to be carried as well as the space required for the storage of these parts.

Where Lost Production Originates

Probably the largest item affecting lost production on a paper machine is trouble with the mechanical transmission, and while it is not always evident at once why the machine is making "broke" it can frequently be traced to belt slippage, and not infrequently will the belt have to be taken up before production can be resumed, the vertical belt drives from the cone pulleys being one of the worst possible types of belt drive and requiring constant attention. In addition to the belt trouble, there is frequent gear

Continued on page 600

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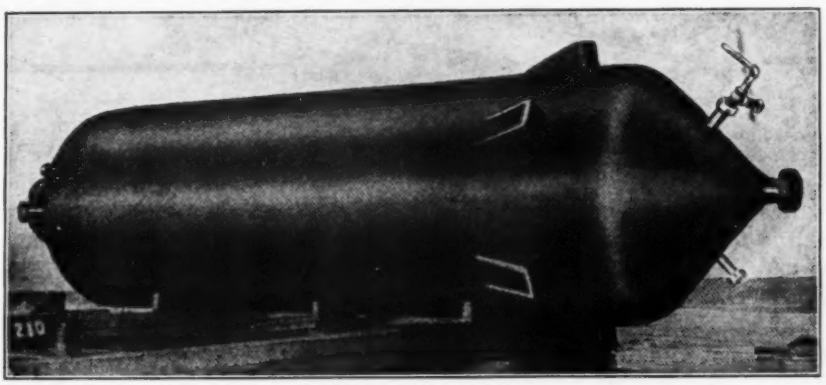

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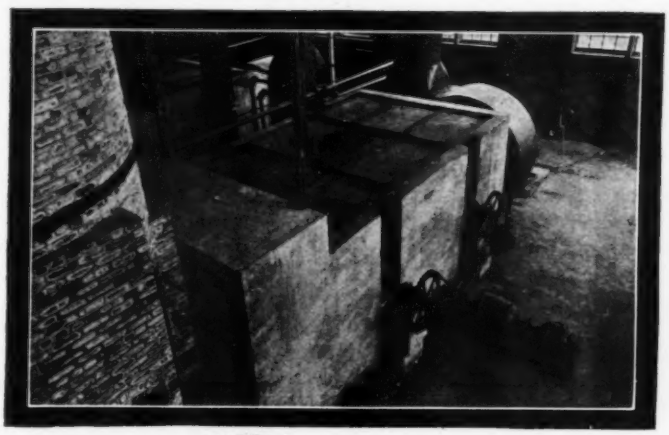

Swenson Evaporators in the Plant of the Beaver Cove Lumber & Pulp Co.

The Beaver Cove Lumber & Pulp Co. is one of the many paper mills in the United States and Canada that uses Swenson Equipment extensively.

The photograph on this page shows a Swenson Disc Evaporator used in connection with the recovery of sulphate liquor in the Beaver Cove Plant.

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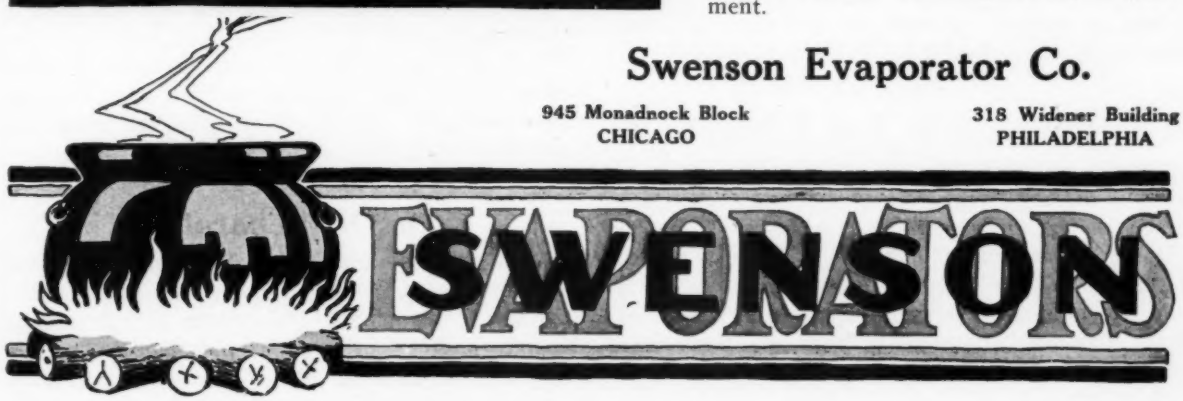

What Is Dry Rot?

The term "dry rot," the Forest Products Laboratory finds, is applied by many persons to any decay which is found in wood in a comparatively dry situation. Thus loosely used the term actually includes all decay in wood, since wood kept sufficiently wet can not decay.

In the more limited sense in which pathologists use the term, "dry rot" applies only to the work of a certain house fungus called Merulius lachrymans. This fungus gains its distinction from the fact that it is frequently found growing in timbers without any apparent moisture supply; in reality it does not grow without moisture and is as powerless as any other fungus to infect thoroughly dry wood. Given moist wood in which to germinate, it is able to make its way a surprisingly long distance in dry timbers, drawing the water it needs from the moist wood through a conduit system of slender, minutely-porous strands.

Wood in the typical advanced stage of dry rot is shrunken, yellow to brown in color, and filled with radical and longitudinal shrinkage cracks, roughly forming cubes. In many instances these cracks are filled with a white felty mass, the interwoven strands of the fungus. The decayed wood is so brittle and friable that it can easily be crushed into powder.

The dry rot fungus is active in nearly every region of this country, in Canada, and in Europe. It is very destructive to factory and house timbers and to logs in storage. Coniferous or soft woods are more commonly infected by it than hardwoods.

A Concrete Ash Tank

"One of the best investments we ever made" is the way a large paper company expresses their regard for their ash handling systems.

The accompanying illustration is from a photograph and shows a concrete tank having two steam jet ash conveyor lines leading to it from the boiler plant. One line handles ashes from two stoker fired boilers, while the other takes care of seven hand-fired boilers.

A jet of high velocity steam carries the ashes from the pit in the boiler room to this disposal tank outside of the building, from which they are removed at intervals by wagons or trucks.

Six to fifteen tons of ashes are accumulated daily, depending on the time of year. The average steam

pressure under which the systems are operated is 95 pounds.

There are many mills who in an endeavor to meet increased costs and shortage of labor are installing these conveyors, and in every case the ashes are being handled quickly and economically.

An Oil Separator

It is a generally admitted fact that separators for the removal of oil from exhaust steam are essential in every power plant. The steam in its passage through engines or pumps, picks up a certain amount of lubricating oil. If this oil is permitted to remain in the steam and enter the heating system,

Modern Pulp and Paper Making

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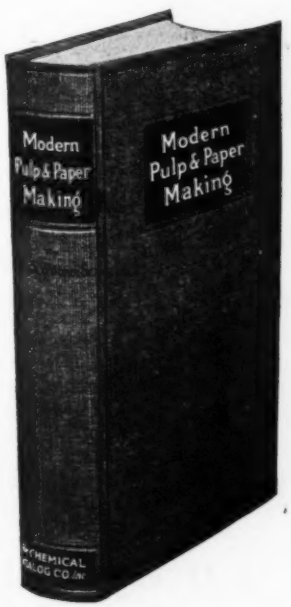
How to care for wet felts, dryer felts, deckles, etc.

How to start up a Fourdrinier machine.

How to install and operate a saw-mill.

How to detect the causes of breaks and defects and how to remedy them.

How to calculate the retention of clay, etc., etc.



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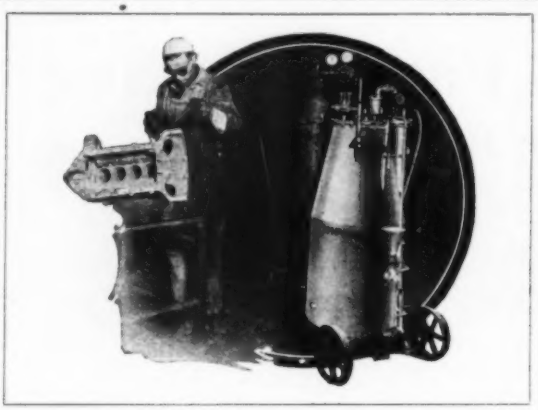

Insure
Against Breakdowns

Should any gear or casting crack in the paper mill these busy days, both operators and employes would face a big money loss through shut-down. For repairs are two weeks to a month in coming!

It's time to insure against these possible breakdowns by having on hand

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Repairs are made in minutes which previously took days. You don't need new parts, because the old ones may be welded until stronger than new.

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If you already have a welding outfit you cannot afford to be without this generator.

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The Imperial Brass Mfg. Co.
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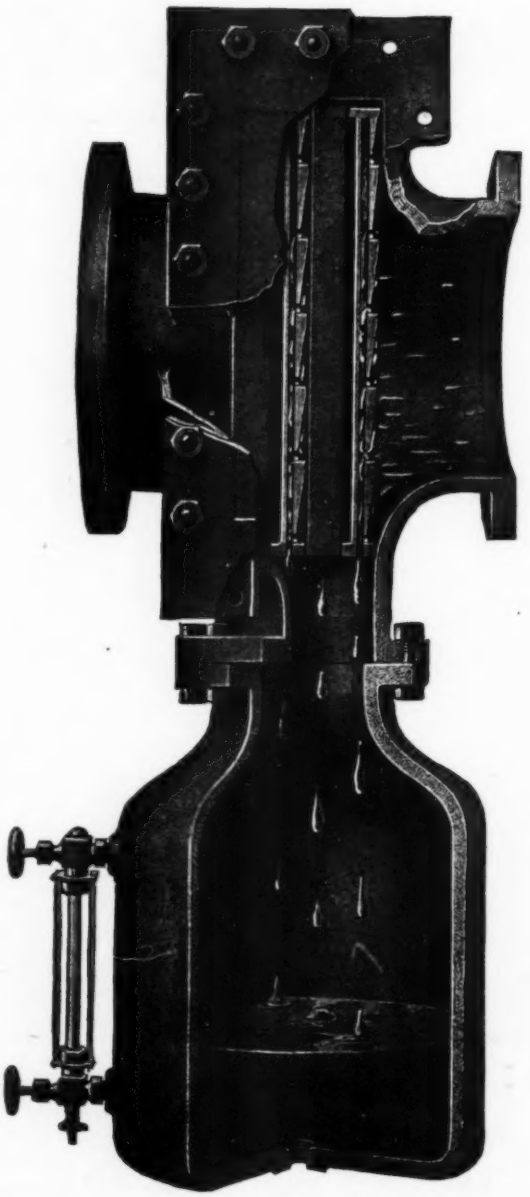
the result is a coating of oil on the pipes and radiators, and, therefore, impaired efficiency of the heating system. If exhaust steam is used for manufacturing purposes, the oil is equally undesirable.

Furthermore, it is desirable to return the condensation from this exhaust steam to the hot well



for use as boiler feed water, and thus save the heat in this condensation. If oil is permitted to enter the boiler with the condensation, it forms a coating on the heating surface, necessitating the burning of additional coal and often results in severe damage and sometimes in disastrous accidents.

The accompanying cut shows clearly the construction of a separator. The shell and baffle plates are of cast iron. These multiple baffle plates are of

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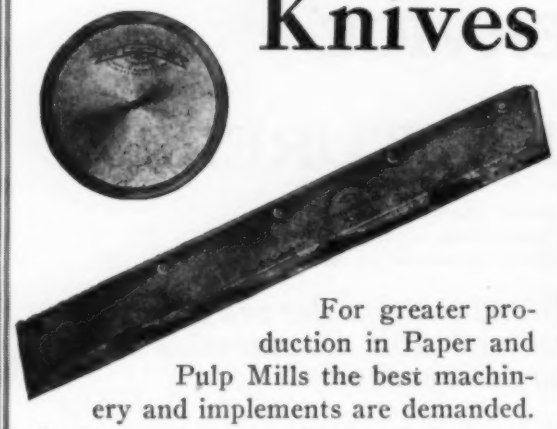
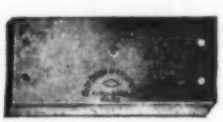


For greater production in Paper and Pulp Mills the best machinery and implements are demanded. In the preparation of pulpwood strong, sturdy knives that hold their cutting-edge, and saws of the best grade are essential to this end.

If Simonds Chipper and Barker Knives are specified you are assured of the best possible service. The exceptional qualities of the Simonds Inserted Tooth Cut-Off Saw has long been familiar to mill men. The quality of these mill knives is equalled only by Simonds Paper Cutting Knives and Circular Paper Cutters. They are Simonds Quality backed by Simonds own steel and workmanship. Look for an extraordinary cutting service when you order Simonds Knives or Saws.



Simonds Manufacturing Co.

"The Saw Makers"

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special staggered grid construction and are so designed as to insure the removal of all oil from the exhaust steam before it leaves the separator. The oil after being deposited on the saw-tooth grids, enters a duct inside of the grid bars and flows through this duct to the large receiver reservoir at the bottom. This feature prevents steam from picking up the oil again after it has been deposited on the baffle plate.

This separator fulfills one of the most important requirements of an efficient oil separator. It is apparent that if an oil separator is efficient that the separation cannot be accomplished without the baffle plate surfaces becoming gummed with oil and grease and also that this coating reduces the separating efficiency. It is, therefore, essential that an oil separator be so constructed as to be easily cleaned. The baffle plates in this separator are removable through an opening provided and may be taken out and cleaned in a lye solution and returned to the separator ready for another period of efficient service.

Accident Records

Report from Seventeen Mill Members of the National Safety Council January to April, 1920, inclusive

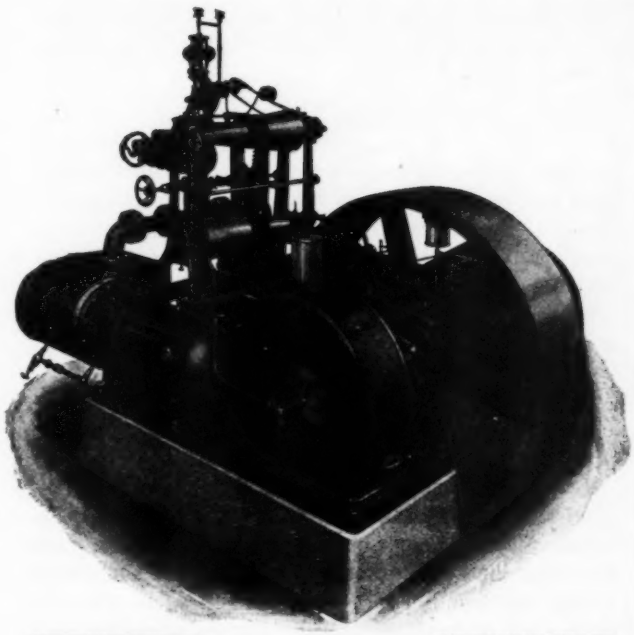
Company	Average Number of Employees	Total Hours Worked		Number of Lost Time Accidents	Total Days Lost	Frequency Rate	Severity Rate	Deaths	Permanent Disabilities
1	114	92,503		3	6	32	.065	0	0
2	90	90,760		4	19	44	.21	0	0
3	589	130,000	(1 mo. only)	11	36	85	.27	0	0
4	325	338,000		14	97	41.3	.29	0	0
5	260	214,389		5	71	23.4	.33	0	0
6	252	210,132		6	75	28.6	.357	0	0
7	675	567,000		31	252	54.5	.445	0	0
8	1,226	1,020,120		37	543	36	.53	0	1-finger
9	312	257,800		14	158	54	.61	0	0
10	1,248	953,000		114	880	119.5	.92	0	0
11	221	204,770		15	215	73.2	1.10	0	0
12	330	271,972		16	382	59	1.41	0	1-finger
13	427	374,935		23	573	61.5	1.53	0	1-finger
14	288	290,678		13	486	45	1.67	0	1-finger
15	1,183	1,292,088		33	12,335	25.5	9.52	2	0
16	570	370,084	(3 mo. only)	35	6,371	94.5	17.25	1	0
17	258	235,333		26	6,696	111	28.5	1	1-finger
Total		6,913,564		400	29,295	57.8	4.23	4	5

Note: The frequency and severity rates are calculated according to the method adopted by the United States Bureau of Labor Statistics and by the International Association of Industrial Accident Boards and Commissions, and recommended by the National Safety Council. Deaths and permanent injuries are weighted according to the standard scale adopted by the above organizations.

The above records are arranged in order of their severity rates, as the severity of accidents has a more important influence on plant production and accident costs than does the frequency.

The average of these seventeen plants, operating a total of 6,913,354 hours, shows a frequency rate of 57.8 and a severity rate of 4.23. This high severity rate is caused principally by the four fatal and five permanent injuries. Omitting these nine serious accidents, the severity rate would be only 0.55. It will be noted that seven of the above companies have a severity rate of less than 0.5, that ten have a rate of less than 1.0, and that the only plants having a severity rate of more than 1.0 are those having a death or permanent injury.

This table seems clearly to indicate that paper



Variable Speed Engine

The engine illustrated above is especially designed to drive paper machines, giving continuous and reliable service. A patented safety device protects your employees and plant.

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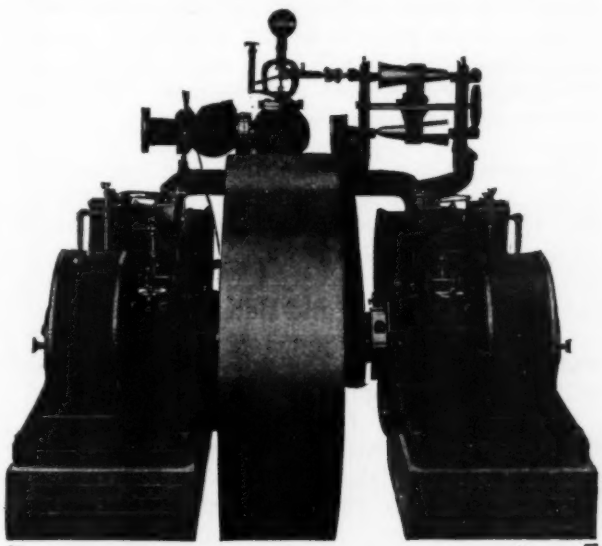

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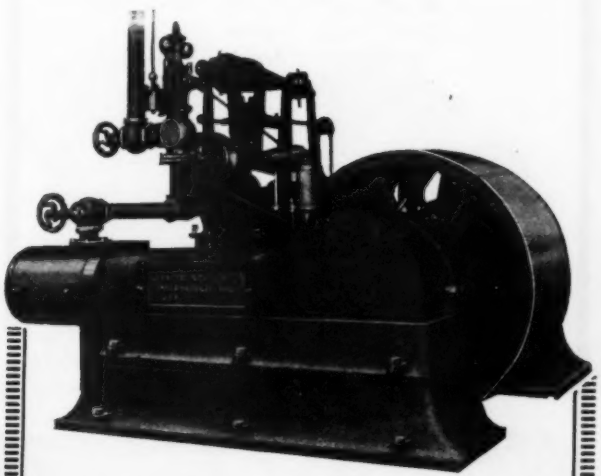

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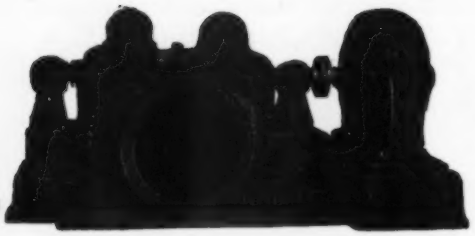

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WHEELER CENTRIFUGAL PUMPS, being the result of such co-operation, embody the most practical designs. The casing is split horizontally along the shaft, which gives easy access to all wearing parts. Impellers are of the enclosed double suction type cast in one piece. They are ordinarily made of government bronze, but special alloys are provided to suit conditions. We will provide for any drive—motor, turbine, belt, or rope.

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Such a practical test—another phase of Wheeler service—is the undisputed proof before installation of the service a Wheeler centrifugal pump will give afterwards.

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100

and pulp mill members should not be satisfied unless they can keep their frequency rate below 50 and their severity rate below 0.5.

Power Plant Management

Continued from page 563

case air is allowed to leak into the flues and mingle with the gases after they have left the heating surfaces, the temperatures may be brought down to almost any point above that of the atmosphere, but without any reduction in the amount of heat wasted.

2—Indicate condition of furnace and boiler, such as:

(a) Dirty fire.
(b) Holes in fire.
(c) Presence of scale or water surfaces.
(d) Presence of soot on fire surfaces.
(e) Faulty condition of baffles.

Of all the conditions just mentioned, unclean heating surfaces are most important, since they are most prevalent and constant. Many cases are on record where continuous soot removal, such as is obtained by the use of mechanical soot blowers, has effected a continued reduction in average flue gas temperatures of 80 degrees.

In conclusion, there is no more reason why you should ask or permit your boiler-room crew to work without the instruments we have discussed, than to permit them to work without a pressure gauge. Given knowledge and good intention, they will soon improve operating conditions. At present the state insists upon the pressure gauge. The time is rapidly approaching when it will insist upon the other instruments. Forewarned is forearmed. Give your men the needed appliances.

Cheesman-Elliot Co. announce the removal of their main office on May 1st, 1920, from 100 William Street, Manhattan, New York City, to 23 Flatbush Avenue, Brooklyn, New York.

Belt Shifters and Belt Shippers

Continued from page 585

signed that the shipping of belts to and from them will be safely accomplished.

General

Have all belt shifters of the same general type in the shop move in the same direction to stop machines, so far as this is practicable—either all "right" or all "left." Men operating various machines under these conditions are more likely to stop machines quickly in an emergency.

A belt should always be unshipped by throwing it off the driving and not off the driven pulley.

If it is necessary for a workman to use a ladder while throwing a belt on a lineshaft pulley, another workman should be at the foot of ladder to steady it; or the ladder should be equipped with safety hooks to prevent it from swinging to one side.

A belt is often too large to be handled by a pole,

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WATER

PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

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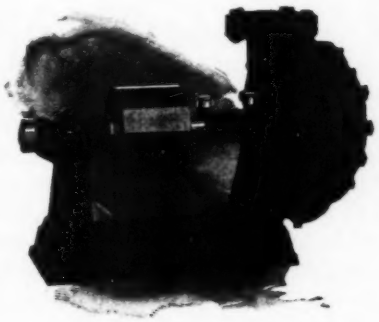
Centrifugal Pumps

BELT OR MOTOR DRIVEN



Extra wide ring oiled bearings. Overhanging casing allowing the discharge to be taken at any angle desired. Removable outer head so that impeller may be withdrawn without disturbing the casing. Hydraulically balanced impeller insuring minimum end thrust. Impeller machined all over and turned to make a close running fit with the casing.

Finished with open runner for handling paper stock.

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We Also Manufacture **Power Pumps, Deep Well Pumps, Boiler Feed Pumps, Vacuum Pumps, Horizontal Power Air Compressors.**

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Rocking Grates

15% Less Coal
an increased steam
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VALLEY IRON WORKS
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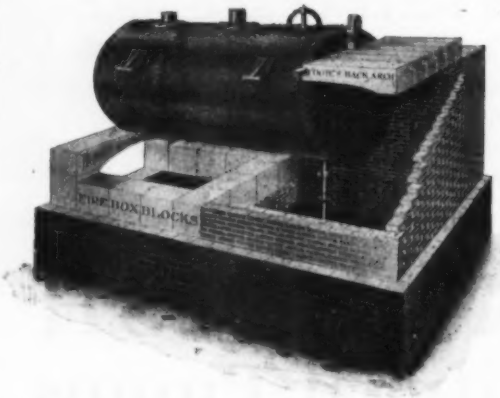
A Boiler Setting Material That Has Many Advantages



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You can get a set at once to fit your boiler and their many advantages will be evident. Cost of installing is low—cost of repairing is equally low because you only replace such parts as need it. That "Steel Mixture" gives satisfaction is attested to by our list of over 8,000 users. "Steel Mixture" certainly can reduce your boiler costs. SEND THE COUPON FOR MORE INFORMATION.

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"STEEL MIXTURE"

and it becomes necessary for a workman to use a ladder in replacing it. When the ladder is used, it should be placed on the side of the pulley opposite the belt, as this position facilitates operation and lessens the danger of the workman becoming caught and being drawn over the shaft. This is a dangerous operation at best, and should be avoided wherever possible, especially on high-speed shafts.

Paper Machine Drive

Continued from page 590

breakage, bearing troubles, etc., which may result in several hours shutdown at each interruption.

Not only does the mechanical system of drive interfere with production directly in the ways above mentioned, but indirectly imposes limitations on the output of the machine on account of the limitations in the speed at which it is possible or practicable to operate. This limitation is determined by a point which is always reached in the speed of a paper machine, where mechanical drive is used, above which the increasing cost of maintenance and lost production makes it impracticable to go. This is because of increasing and varying belt slippage resulting in an excessive amount of "broke," gear trouble, clutch trouble, difficulty in holding the equipment down and in alinement caused by excessive vibration, etc., and in addition to this the mechanical transmission losses increase so rapidly at the higher speed as to make the power input to the machine almost prohibitive.

The Question of Belt Slippage

Let us analyze a little further the question of belt slippage with its effect upon the machine section speed and paper breakage. It is well understood that in every belt drive transmitting power there is a certain belt slippage and this slippage is dependent largely upon the power being transmitted, although it is also considerably affected by other conditions such as atmospheric humidity, temperature, condition of the surface of the belt and pulleys, belt tension, the presence of particles of oil or water on the belt or pulley, etc. However, if we assume that all of these other factors for any given time remain practically constant, the belt slippage might be assumed roughly to be approximately proportional to the load being transmitted. Now, if we assume that there is a constant slippage of say 2 percent when the belt is transmitting its normal full capacity with constant load, any variation in load might be expected to result in a somewhat corresponding variation of belt slippage, and therefore in the speed of that section of the machine. Should there be a variation in load on the belt of say 10 percent, we would expect to get a variation in the belt slippage of something like 10 percent of the former slippage, or per-

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You cannot buy the accident prevention service of the National Safety Council. As a member you automatically acquire all of the Council's thoroughly organized weekly service. And its accumulation of data and statistics, its magnificent experience, is yours to use at will—in facilitating the safety effort of your plant.

The National Safety Council was organized as a co-operative association with the sole object of assisting member plants to prevent accidents. The National Safety Council today, while greatly increased in size, is still operating as a purely co-operative, non-profit-making association with the same objective—accident prevention—as its goal.

It has forced recognition as the headquarters of safety activity in America through its achievements—which stand as mile-posts in the history of accident prevention.

What its service has helped others to accomplish, it can help you to accomplish. Write the business division for details today.

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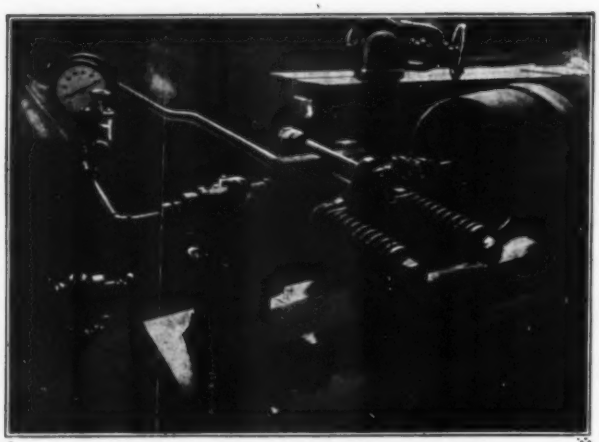

This is the NASH AIR SHAKE, which will produce a more even shake, and therefore better sheet of paper than can be made by any present method.

Prepare for Normal Times

THIS is the advice of the management of a mill that has never solicited for business. Make your paper better than your competitor and you will get the business. The **Nash** Air **Shake** will do this for you, and then some; but remember the facilities for building this machine are limited to about six each month. First come first served. Some of you must wait, but do not wait too long or you won't be in line. People are not reading ads for amusement, they seek information, and they want it from a man who seems sincere.

I am sincere.

WILLIAM C. NASH
NEENAH, WIS.

haps a variation of 2/10 of 1 percent in the speed of the section.

In addition to the variations in belt slippage caused by variations in load, there are also changes in belt slippage and consequent changes in the section speed caused by variations in the coefficient of friction which result from particles of dust, dirt, grease, water, etc., and from water vapor and atmospheric changes which are constantly going on. Any of these factors may or may not cause sufficient change in the belt slippage to break the paper, but are objectionable and contribute to the sum total of trouble experienced and loss of production.

What Has Been Done to Improve Conditions

Let us now see what has been done to improve these conditions. Some ten or twelve years ago after electric drive had fairly established itself in the paper industry, several serious efforts were made by a number of electrical manufacturers to introduce a system of individual motor drive wherein adjustable speed direct-current motors could be geared direct to the machine shaft on each section of the paper machine, thereby eliminating the line shaft, bevel gears, friction clutches, belt drives, etc. While a great improvement in the mechanical arrangement was effected, as well as in the overall efficiency of the installation, the fact immediately became apparent that the speed regulation of the several motors driving the various sections of the variable speed line was of vital importance and not so easy to obtain. It was also soon discovered that it was quite impossible to design motors, the relative inherent characteristics of which were sufficiently alike to give them absolutely the same speed regulation under all operating conditions, making it necessary to resort to external control or regulation in order to hold the speed of the various motors sufficiently alike to prevent the breakage of the paper as it passes from one section of the machine to another.

As there were no speed regulators or governors on the market, which could be expected to hold the speed of the motors much closer than 1 percent or 0.5 percent, at the best, it was practically useless to search for remedies in that direction, and in connection with the machines for individual motor drive, where installations were actually made, hand operation of field rheostats for controlling the motors was resorted to. While hand operation of the field rheostats, on hand regulation, has in a few instances kept the machines in operation and resulted in a moderate degree of success, a number of other installations were removed on account of the difficulty or impossibility of controlling the speed well enough to make paper on a commercial basis. Where the individual motor drive was, however, ultimately kept in operation in the case of the few machines mentioned, the degree of success finally attained was not

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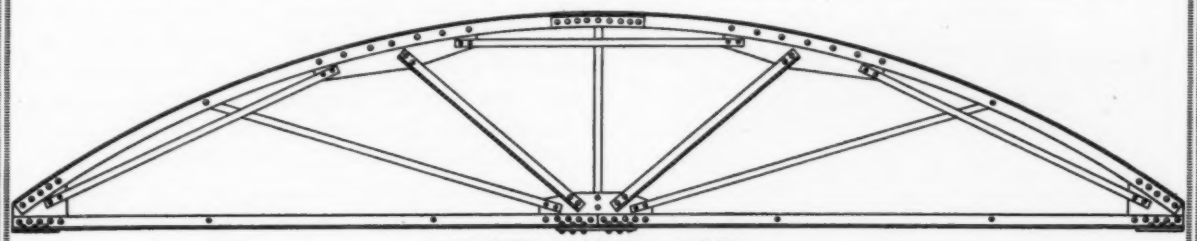


GRAVES ECONOMY TRUSS
(Patents Pending)

The truss that reduces your fire risk

Why use wood trusses when you can obtain the Graves Economy Steel Truss at practically the same price? These trusses are light, strong, economical and fire proof, and obstruct very little light. Easily and quickly erected, as they are shipped in completely fabricated form for most sizes, or in two parts for larger sizes.

Prompt Service and Satisfied Customers Is Our Motto

CONTINENTAL BRIDGE CO.

General Sales Office **460 Monadnock Block, Chicago**

Works*: *Peotone, Illinois

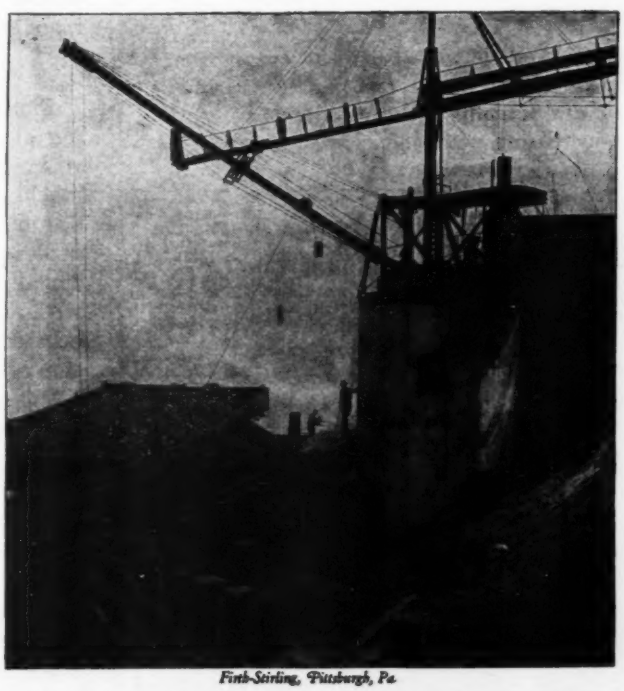
Coal-Storage—and the "Auto-Crane"

AN "AUTO-CRANE" alongside your unloading track will empty a long string of cars in double-quick time.

Then, if storage space beside the track be limited, the "Auto-Crane" will climb right up the stock-pile and rehandle, or "wing back" the coal—giving as deep a pile as needed and conserving track-frontage space.

The "Auto-Crane" works rapidly, steadily, dependably, and at remarkably low tonnage costs.

Attractive booklet "Handling Coal with the 'Auto-Crane'" tells the facts. We'll gladly send it upon request.

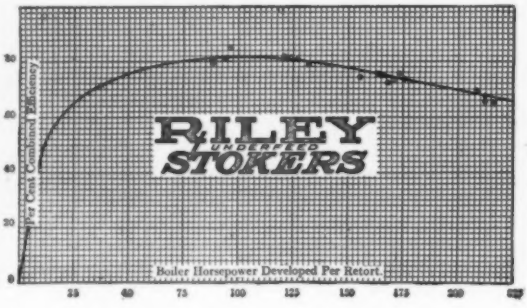


Firth-Stirling, Pittsburgh, Pa.

The John F. Byers Machine Co.
311 Sycamore Street, Ravenna, Ohio
Sales Representatives in Twenty-Five Leading Cities

AUTO-CRANE
BECKWITH PATENTS

ARE YOU WASTING COAL?



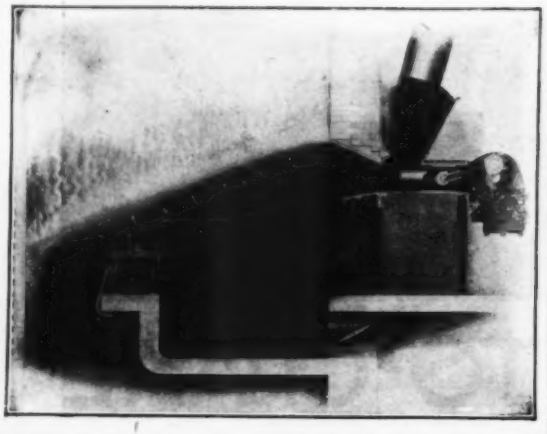
If your boilers are operating at 65% efficiency, whereas you ought to be getting 75% or 80%, then you should investigate to-day the possibilities of RILEY UNDERFEED STOKERS.

The first year after installing Riley Stokers, the Haverhill Boxboard Company saved ten tons of coal a day, and reduced their operating force by thirty-six men—a total saving of $52,000.00.

Out catalog shows a cut of an evaporation curve. From it you can figure just what you can actually save in dollars and cents by increasing your efficiency.

Catalog D-7 Sent on Request

Sanford Riley Stoker Co.
Worcester, Mass.



until after the electrical manufacturers had spent a great deal of time and money in the undertaking, and it may also be said that no small part of the credit for the operation of these equipments has been due to the willingness and determination of the operators to make a success of the equipment and individual system of drive. However, even with the best of intentions on the part of the operators, it has been impossible to maintain the speed of the motors with a sufficient degree of precision to prevent breakage of the paper and considerable loss of production on account of the imperfect speed control regulation.

Had the electrical manufacturers fully understood the exacting regulation requirements of sectional individual motor drive, they probably would not have undertaken this problem when they did, as they had no solution for the regulation problem at that time.

Slow in Adopting Sectional Individual Motor Drive

Quite naturally, reports of the several failures of individual motor drive, and the only moderate success attained by others, in this radical departure from the old established mechanical drive, was rapidly circulated throughout the paper industry, and on account of the hazard involved in undertaking a project of this kind, it was natural that everyone should become exceedingly skeptical, and inasmuch as no solution was offered, a lapse of some years passed without the installation of any new paper machines with sectional individual motor drive.

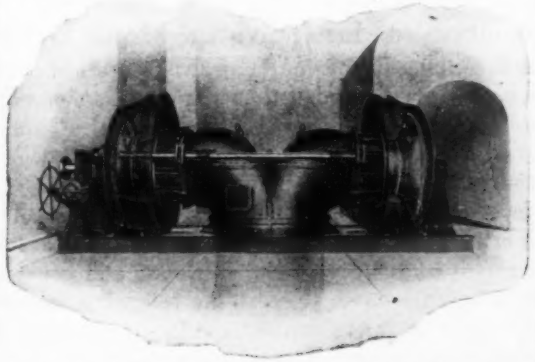
Speed Regulation Problem Solved

Finally an answer has been found to the perplexing question of speed regulation, which has opened the way for the long-looked-for revolution in paper machine drive, whereby this phase of paper manufacture can take its place with that of the most modern and advanced in the industry; in fact sectional individual motor drive for paper machines with automatic regulation and control can now properly occupy a place second to none in the application of electrical equipment to mechanical apparatus.

The secret of the final success of individual motor drive is the development of a speed regulator which is sufficiently sensitive to indicate the most minute speed variations of any of the motors and quickly to correct it.

It should be noted that in order to maintain the proper "draw" on each section of the machine, it is necessary that the motor driving each section maintain its correct speed without a variation of so much as 1/10 of 1 jerecent. Not only must the motor maintain this high degree of regulation when the load on the machine is constant, but when the load varies at times, such as when the bearings are being oiled, when the paper breaks between the dryers and the calenders, or on any such occasion where there is

SMITH HYDRAULIC TURBINES



Accompanying view shows one of eight horizontal shaft "SMITH" Turbine units in successful operation in the Cornell Wood Products Co. mill at Cornell, Wis. Each unit develops 1550 H.P. under 37' 6" head.

FOR STABILITY AND EFFICIENCY SMITH TURBINES ARE UNEXCELLED

If interested, write for Bulletin "S"

S. MORGAN SMITH CO., York, Pa.

BRANCH OFFICES:

176 Federal St. BOSTON
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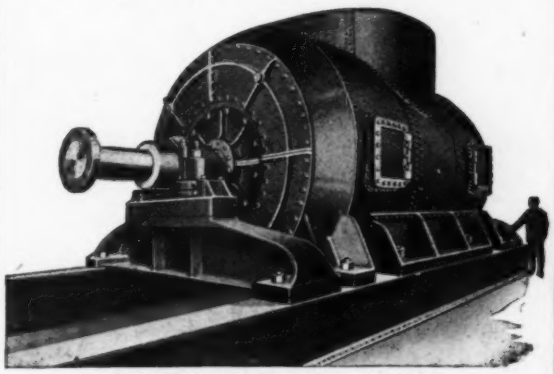
405 Power Bldg. MONTREAL

Leffel Turbine Water Wheels

High Speed — High Horsepower — High Efficiency

Vertical and Horizontal Designs



Large Horizontal Direct Connected Unit

Write for Bulletin 54

The JAMES LEFFEL & CO.

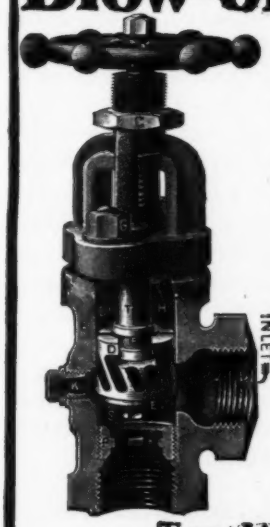
SPRINGFIELD, OHIO

Boston Office: Room 610 Compton Bldg., 161 Devonshire Street, Boston, Mass.

SALES ENGINEERS

B. F. Groff, 556 Woolworth Bldg., Lancaster, Pa.
H. H. White, 1503 Fourth Nat'l Bank Bldg., Atlanta, Ga.
William Hamilton Co., Ltd., Peterboro, Ont., Canada

CYCLONE Blow-off Valve



Built in accordance with the revised State Boiler Law, without bolt-slots in either body or bonnet.

Has outside screw and yoke top and the Powell Patent Pusher Packing Gland.

A SELF-CLEANING BOILER VALVE.

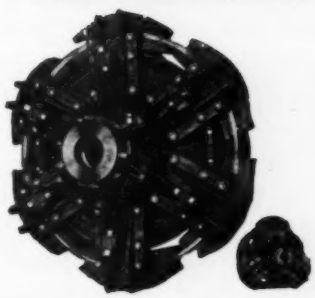
Disc and Seat Ring made of our incomparable wearing metal, "POWELLIUM BRONZE."

Ask your dealer for "Powell" Boiler Valves" or write us.

Boiler Valve Booklet on Request.

THE WM. POWELL CO.
DEPENDABLE ENGINEERING SPECIALTIES.
CINCINNATI, O.

THE HILL CLUTCH CO.



Hill Friction Clutches

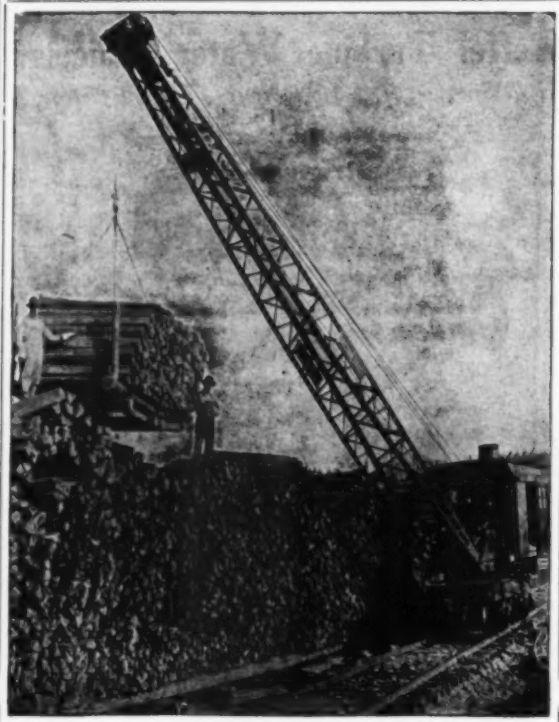
(SMITH TYPE)

¶The most powerful clutch built. Vise-like jaws in pairs grip the ring, and are actuated by a powerful toggle mechanism. No springs are used. Clutch is self-centering, and in a friction clutch cut-off coupling no alignment bushing is required, so that when clutch is disengaged there are no revolving parts in contact—therefore, no wear

Send for Catalog

THE HILL CLUTCH CO.

CLEVELAND, OHIO
New York Office, 50 Church Street



BROWNHOIST

Handling Materials at the Mill

IS YOURS one of the many mills which handles considerable pulp? Some of these have found it to be more rapid and economical to do this handling with a Brownhoist locomotive crane. A Brownhoist will not only place the pulp wherever it is needed, but will handle your coal, switch the cars and take care of innumerable jobs which come up around the yard. If you have much handling to do, our long crane experience should be of use to you. We will gladly give you any information for the asking.

The
Brown Hoisting Machinery Co.
CLEVELAND, OHIO, U.S.A.

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as smaller Cranes and Hoists

Branch Offices in New York, Pittsburgh, Chicago and San Francisco.

a variation in the load, the regulator must act so quickly as to prevent the breaking of the sheet or the accumulation of slack between the sections and yet must be absolutely "dead beat" in action and not overtravel.

Requirements for Individual Motor Drive

In the change from mechanical to electrical drive it is nearly always found that many refinements are made possible in the operation and control of equipment of all kinds and this is true to a marked degree in the case of sectional individual motor drive for paper machines.

In order to take advantage of the various features which will contribute to the efficiency and convenience of operation, we suggest the following requirements for a complete and satisfactory system of individual motor drive for paper machines:

1—To have the entire machine and each individual section completely under the control of the operator by push button stations easily within reach.

2—Ability to start the machine or any section of it by push button stations and to operate these at a very slow speed for considerable periods of time for putting on felts, or for similar operations.

3—To be able to start any section of the machine independently and to bring it up to the running speed whether or not the other sections are in operation.

4—To have the regulator controlling the speed function automatically without requiring any personal operation or attention.

5—To enable the operator to shut down any section quickly, or the whole machine as a unit.

6—To provide means for increasing or decreasing the speed of the entire machine from a push-button control station.

7—To control the speed regulation of the entire machine as a unit, with a high degree of precision so as to maintain the proper weight of the sheet, drying uniformity, etc., and to maintain a perfect draw at each section of the machine so that no loss of production will be occasioned on account of imperfect regulation.

8—Another requirement of equal importance is that all parts of the equipment be rugged and dependable so as to eliminate entirely the possibility of interruption of service on account of transmission troubles.

Since continuous and uninterrupted production of paper is of primary importance in the operation of a paper machine, it is of utmost importance that there be no weak link in the system.

Advantages of Sectional Individual Motor Drive

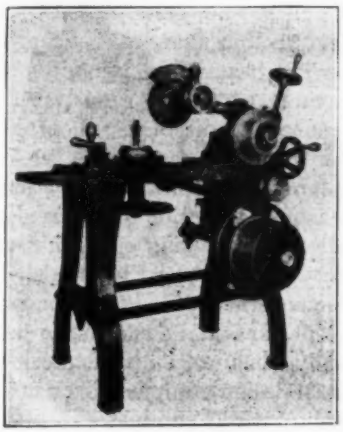
To cite some of the advantages of sectional individual motor drive over the former mechanical system of drive, some or all of which may have been

The Best Grinder

The Standard Koegel

Save money by sharpening your own knives

Costs less to do it yourself and you get better work and more of it if you use only sharp cutters.



GIBBS-BROWER CO.

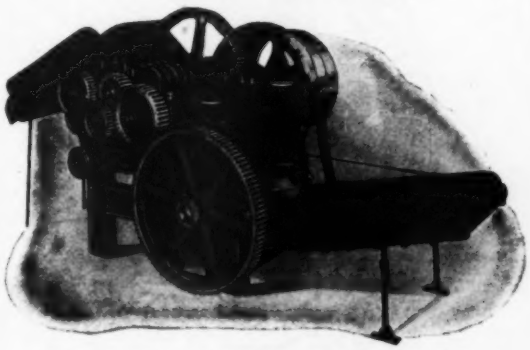
SOLE AGENTS

261 BROADWAY NEW YORK CITY

Telephone, Barclay 8020

Improved Rag Cutter

"Cuts the Stock Both Ways"



This rag cutter is a glutton for work, and we believe will do double the work of an ordinary cutter.

Especially adapted for mills using high grade stock.

Write us and we will be pleased to tell you more about them.

B. F. PERKINS & SON, Inc.

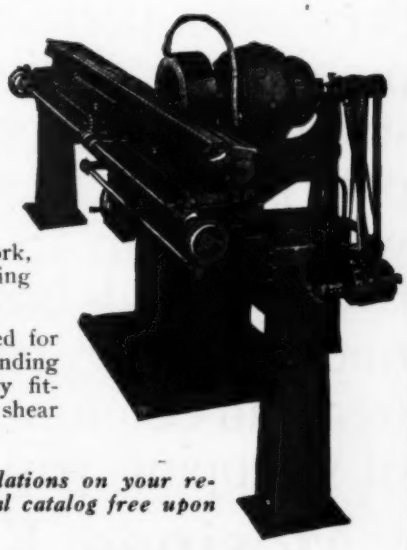
Holyoke, Mass.

Scientific Grinding Development

A Machine for Every Purpose

Straight Wheel, Cup Wheel, Ring Wheel Grinders. Hand or automatic, wet or dry grinding. Traveling grinding wheel, stationary work, or stationary grinding wheel, traveling work.

Full automatic, adapted for every variety of grinding service in scientifically fitting knives, saws, shear blades, etc.



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presents a perfect wrapping paper, weight and strength for each wrapping purpose. Made in all weights from 15 pounds to 100 pounds basis. The one complete, standardized and economical line of wrapping paper sold.

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"The Wrapper that Delivers the Goods"

drawn by inference from what has already been said, we have the following:

Through the use of a thoroughly high grade, totally enclosed, self-lubricated, herringbone gear set, by means of which the motor will be connected to the machine section shaft, the equipment can be made entirely noiseless and vibrationless, having a maximum degree of efficiency; no personal hazard is involved, as there are no exposed gears, no clutches, no pulleys, no belts, and the only shafting is the short section shaft of the machine itself. There is less fire hazard, on account of the exceedingly few bearings which are well lubricated and require no personal attention for months at a time, and the quantity of oil required is far less than with the old system, practically the only maintenance being the occasional attention to brushes on the motors and the periodical changing of oil in the motor bearings and gear set case at long intervals. So far as spare parts are concerned, this is an almost negligible quantity, except that it is desirable to have a spare motor on hand as insurance against accident, but so far as the transmission equipment is concerned, the mechanics can be entirely eliminated.

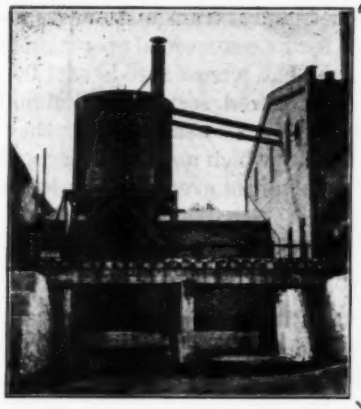
The electrical equipment, reduction gear sets, control apparatus, etc., for a system of this kind, should have a life several times as long as would practically any part of the old mechanical system and with much greater reliability, and impart a flexibility which could not be approached under any other system.

It has been demonstrated that with sectional individual motor drive the variable speed line of the paper machine can be driven with approximately half of the power required where mechanical drive is used on account of the great reduction in power losses. It is also possible greatly to increase speed and production. Another advantage in the case of new mills being constructed, is the fact that with individual motor drive it may be possible to eliminate the entire basement under the machine room, also to make the machine room somewhat narrower.

With the introduction of this system of drive it is no longer necessary for the machine tenders constantly to watch the draw of each of the sections, for when the "draw" has once been properly adjusted, it will be maintained automatically without further attention.

Now in addition to all of these items, consider the possibilities of increased speed. There are a great many machines in operation at the present time, the speeds of which can not be consistently increased on account of the limitations of the mechanical transmission. With individual motor drive, however, there will be practically no limit so far as the drive is concerned, inasmuch as sufficient power can be delivered and a perfect draw can be as well maintained at a high speed as at a low speed.

I believe it is universally conceded that for large high-speed news machines, the maximum speed which



At the Boiler House of Bryant Division Number 2

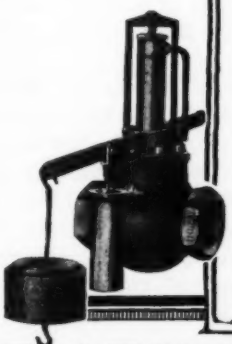
Number 2 is only one of five plants of the Bryant Paper Company, Kalamazoo, Michigan, that are handling their sales quickly and economically with

AMERICAN
STEAM ASH CONVEYORS

The illustration to the left shows the conveyor line leading from the boiler house to the steel ash tank. **One handling** carries the ashes to the tank, from which they are dropped into auto trucks.

The American Steam Ash Conveyor will save money for you. Investigate. Ask for Catalogue P.

AMERICAN STEAM CONVEYOR CORPORATION
Coal and Ash Handling Equipment
Chicago: 326 West Madison Street New York: 110 West 40th Street



Saves Every "Savable" Heat Unit

THAT is why the Davis Regulator is practically indispensable in paper mills where profit is based on operating economy.
Once set for a required delivery pressure, no amount of fluctuation in the boiler pressure or variation in the demand for steam can prevent the Davis Pressure Regulator from SAVING EVERY HEAT UNIT THAT IS NOT ACTUALLY NEEDED FOR THE WORK. Write to the G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, for a descriptive booklet.

DAVIS VALVE
STEAM SAVERS SINCE 1875
SPECIALTIES

The YARYAN EVAPORATOR

As engineer for the Yaryan Co. I installed, in 1886, the first Yaryan Evaporator placed in a soda pulp mill for the recovery of soda.

The Yaryan Evaporator is familiar to all soda pulp manufacturers.

Many important improvements have recently been made, but the principle has been retained.

It is the ideal evaporator for Soda and Sulphate Mills

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Paper Mill Lubrication Raised to the Highest Degree of Efficiency

In order to "make good" day after day in paper manufacturing a lubricant must be able to "stand up" under excessive bearing pressure and resist the heat transmitted by steam as well.

Extensive use of Keystone Grease in large paper mills throughout the country conclusively proves it to be unparalleled for the lubrication of both calender and finishing rolls of any character, particularly where unusual heat conditions exist.

Write today for our free Bulletin Number 23.

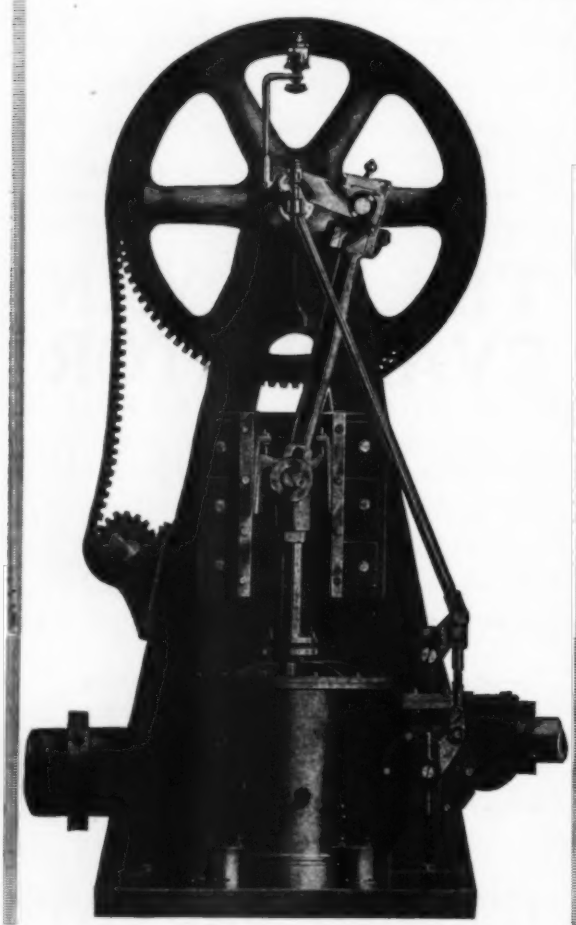
KEYSTONE TRADE MARK Reg. U.S. Pat. Off. GREASE

The Keystone Lubricating Co.

Executive Office and Works:
Philadelphia, Pa.
Established 1884

New York Boston Pittsburgh Chicago St. Louis Denver San Francisco Minneapolis Houston

High Efficiency Vacuum Exhausters



This exhauster is a well designed high efficiency piston displacement machine with extremely low clearance, showing indicator cards closely approximating the ideal for apparatus of this character.

The machine is simple in construction, of few parts which are easily accessible for oiling and adjustment, and is capable of long periods of continuous day and night operation without stopping for adjustment.

Write for further information.

Glamorgan Pipe & Foundry Co.

Lynchburg, Va.

can be attained with mechanical transmission has already been reached, so far as commercial operation is concerned. This means that where speeds of 1,000 feet a minute or more are desired, sectional individual motor drive will be absolutely necessary, and furthermore, is the only system by which a satisfactory and economical drive can be attained even at much lower speeds.

Electric Water Heater

Continued from page 574

bus, cable, and piping connections is approximately $7,500. Allowing capital and depreciation charges totalling 20 per cent, the net annual return on the investment, if the heater is operated only thirty weeks per year and on the daily cycle outlined, will be $1440, or 19.2 per cent. If operated fifty-two weeks per year, the return will be 48.0 per cent, and if operated at full load, five and one-half days per week, fifty-two weeks per year, the net annual return will be 65.8 per cent.

Of course, in these calculations, the cost of power for the heater is assumed to be zero. This is the correct basis, where the heater capacity is only a small portion of the generating plant capacity, and where it is a question of running the generators partly loaded without the heater, or more nearly fully loaded with the heater.

On the other hand, if additional generating capacity must be installed to take care of the heater, then the fixed charges on the power plant will be increased, and the heater must be charged with its share of the power costs. Under these conditions, it would become a question of balancing the saving in fuel against the cost of power for operating the heater. If, owing to the geographic location of the plant, the cost of fuel is high and the cost of power low, the installation of a heater will prove economical.

If the various factors are known, it can easily be determined whether the installation of an electric water heater will be economical. Let

C_c = cost per 2000-lb. ton of coal.

B.t.u. = B.t.u. per pound of coal.

$E_b = \frac{\text{per cent efficiency of coal burning boiler.}}{100}$

KW = maximum capacity of heater.

K_h = total kw-hr. input to heater per year.

$E_h = \frac{\text{per cent overall efficiency of electric heater.}}{100}$

F_c = annual fixed charges on electric heater.

C_k = cost per kw-hr. at which annual expense of operating heater will just equal saving in cost of coal.

Then

$$\frac{2000 \times \text{B.t.u.} \times E_b}{3412 \times E_h} \times \left(C_k + \frac{F_c}{K_h}\right) = C_c$$

$$\text{Or } C_k = \frac{1.7 \times E_h \times C_c}{\text{B.t.u.} \times E_b} - \frac{F_c}{K_h} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

EASTWOOD Wire Mfg. Co.

Fourdrinier Wires
Cylinder and Washer Wires

Belleville, New Jersey
U. S. A.

WE ALSO MANUFACTURE

Valves, Unions, Cocks, Fittings, Digester Parts, Castings, etc., for Sulphite Mills from Our Perfection Bronze

The LINDSAY Wire Weaving Co.

Manufacturers of

DEPENDABLE FOURDRINIER WIRES

Cylinder Covers and Other Paper Machine Wire Cloth

All Well Made at

Collinwood Station CLEVELAND OHIO

"TYLER" FOURDRINIER WIRES

"In all widths up to and including 250 inches"

CYLINDER FACES
WASHER WIRES
BACKING WIRES

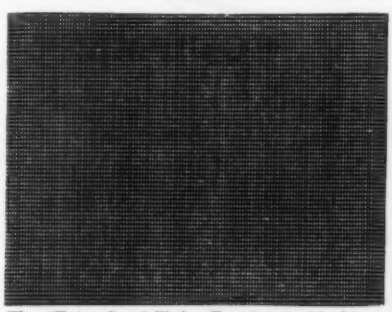
In Brass, Bronze and Phosphor Bronze

Tyler Fourdrinier Wires are dependable, reliable and durable.

The secret of durability is found in the special composition metal that is used in the make-up of the wire, and by reason of its substantial construction a long life with a large tonnage is assured.

Tyler Wires run straight with no inclination of becoming slack at the edges.

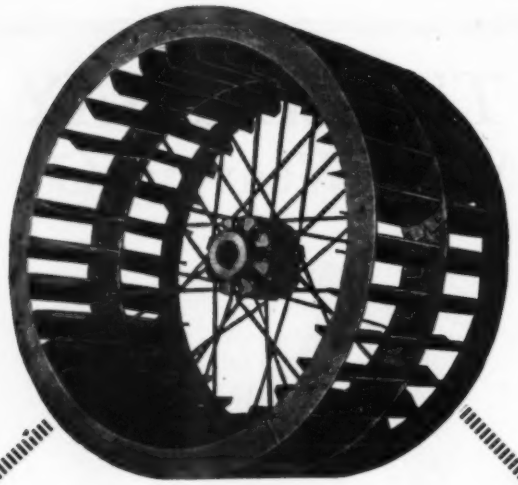
Prices and samples will be mailed upon request.



The "Tyler Special" for Fourdrinier Machines

THE W. S. TYLER COMPANY

CLEVELAND, OHIO



The Air in Your Mill

Heating It — Cooling It — Cleaning It

Let

Bayley

EQUIPMENT

take care of it all. Bayley engineers have had extensive experience in coping with paper mill requirements of heating, ventilating, drying, cooling, dust and refuse disposal, etc., and these engineers are at your service. Any time you wish to consult them on the needs of your mill, they will be ready to give you their expert opinion on any of these lines of equipment.

Forced and induced draft systems, pneumatic chip and ash handling systems; cooling systems for electric generators and for calenders; absorption systems; forced ventilating systems; dust collecting systems.

Write for Details

BAYLEY MFG. COMPANY

732 Greenbush Street Milwaukee, Wis.

If the cost C_k figured from this formula is greater than the actual cost of power generation, then the installation of the heater will effect an economy in operating expenses.

To determine the actual net saving in dollars per year, let

C_a = actual cost of power per kw-hr.

S_n = net saving per year due to electric heater.

Then

$$S_n = (C_k - C_a)\, K_h$$

$$S_n = \left(\frac{1.7 \times E_h \times C_c}{\text{B.t.u.} \times E_b} - C_a\right) K_h - F_c \ldots\ldots (2)$$

To exemplify the use of this formula we will take the case of the paper mill previously considered, using 1000 kw. 15 hours per day and 666 kw. 6 hours per day, 5½ days per week, 30 weeks per year. The values of the various quantities in formula (2) are then

$C_c = \$6.00$	$K_h = 3{,}134{,}340$
B.t.u. $= 14{,}000$	$E_h = 0.90$
$E_b = 0.70$	$F_c = \$1500.00$
$K_w = 1000$	$C_a = \$0.00$

Substituting these in (2) we have

$$S_n = \left(\frac{1.7 \times 0.90 \times 6}{14000 \times 0.70} - 0\right) 3{,}134{,}340 - 1500$$

$= 2945 - 1500$

$= \$1440$, which is the same result as was arrived at in the foregoing.

Flues and Breechings

Smoke flues should be made as short and direct as possible; all turns should be avoided, and wherever these are found necessary, they should be of the largest radius permissible. Bends or turns offer great resistance to the passage of the gases and cut down the draft appreciably.

Flues should be made air-tight and all joints and connections should be well fitted, calked and riveted to prevent the leakage of air. Too much attention can hardly be paid to this point, since many small leakages distributed over the area of a long flue will greatly impair the draft.

A common source of air leakage is the improper fitting of clean-out doors. Asbestos gaskets should be used, and it is advisable to pack the joint between frames and doors with asbestos wool each time the doors have been used.

It is not good policy to try to use babbitt metal over and over again for the reason that every time babbitt metal is melted some of the tin and antimony is burned out. The scum that appears on the top of the metal when it is heated is an oxide formed by the combination of the metal with oxygen from the air.

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The diner feels when he sees the waxed paper sealer that the food will be crisp and palatable.
Every sheet of KVP Waxed Paper is a suggestion of food products at the maximum of goodness.
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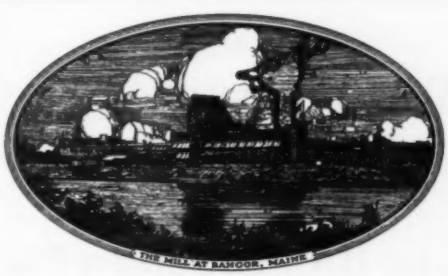

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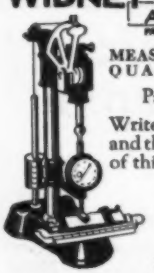
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Physical Tests and Research
352 S. Jefferson St. Chicago

Fall Meeting of T. A. P. P. I.

On September 1 to 3, 1920, the Fall Meeting of the Technical Association of the Pulp and Paper Industry will take place at Saratoga Springs, N. Y., with headquarters at the Grand Union Hotel. The program gives assurance of a most interesting and instructive meeting.

The business session will open on Wednesday morning, September 1, at 9:30 o'clock, in the Casino. Officers and committee reports will be presented, followed by papers on special subjects, an especially important one being on the Washing of Felts. In the evening members and guests will be entertained at dinner by the paper manufacturers of the Hudson River Valley and vicinity. The speakers thus far selected include Mr. C. R. McMillen, of the Union Bag and Paper Corporation, who will act as toastmaster; Mr. Philip T. Dodge, of the International Paper Company, and Colonel C. H. L. Jones, of the Spanish River Pulp and Paper Mills, Ltd.

Thursday, September 2, will be given up to mill visitations, followed by a steamboat excursion on Lake George in the evening. It has been arranged to pay visits of inspection during the day to the plants of the International Paper Company, Finch, Pruyn & Co., Union Bag and Paper Corporation, Standard Wall Paper Company and Sandy Hill Iron and Brass Works. Automobiles will be provided to convey the members to and from the places visited.

On Friday the members of the T. A. P. P. I. and their guests will be taken to the works of the General Electric Company, at Schenectady, where the machinery and electrical apparatus used in pulp and paper mills will be shown in the making. The visitors will subsequently be the guests of the General Electric Company at luncheon. In the afternoon it is planned to visit the felt mills of F. C. Huyck & Sons and the Albany Felt Company.

T. A. P. P. I. asks the pulp and paper manufacturers who are represented by membership in the association to take a broad and generous view of this gathering of the technical men of the industry and arrange for a good attendance on the part of members connected with their mills, or of prospective members. The stated meetings of T. A. P. P. I. afford valuable opportunities for the discussion of common problems, new developments, methods and processes, and it is hoped that mill executives will appreciate the advantages to be derived from their technical advisers coming in personal contact with the engineers and chemists of other mills in the way made possible by the Fall Meeting of T. A. P. P. I. at Saratoga Springs, N. Y., September 1-3, 1920.

Don't be reckless—the penitentiary is full of reckless people, says the National Safety Council.

A soft answer turneth away wrath, but a prompt answer might have prevented it.—Douglas Malloch.

GEORGE F. HARDY

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Contracts made for inspection service by the year. Know the paper mills thoroughly and have had 35 years of this class of service. Many Wisconsin mills now under contract.

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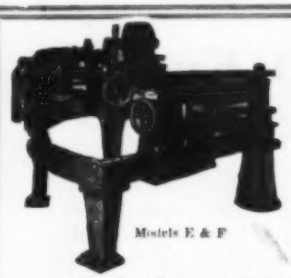

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Will Hold Fall Meeting in Chicago

The executive committee of the American Paper and Pulp Association has decided to hold the fall Business Conference of the Association in Chicago on November 11. Heretofore the association has been having only one meeting a year and that in February. Last year it was decided to hold a fall meeting, which was held in New York in November. This was done as the date of the principal meeting was changed from February to April, but the work of the association has gotten to be of so much more importance than heretofore that it has now been decided to hold a meeting this fall and to hold it in Chicago instead of New York. The meeting will be held at the Congress Hotel. It is possible that some of the associated organizations will hold their fall meetings at the same time.

Paper Salesmen Meet

A local western meeting of the Salesmen's Association of the Paper Industry was held in Chicago, at the La Salle Hotel, Tuesday evening, June 29th. About fifty men were in attendance, and about thirty-five new names were added to the membership roll. After the business meeting supper was served.

It would seem that this association was destined to be one of the important ones in this industry. The men at the head of it are of the type that know how to do things, and to create confidence in the association. Possibly no better man could have been found in the whole industry for the office of president of the association than Mr. Gibson, and the industry can look for a real gathering in Chicago in September when the next big meeting is held.

The time and place for this meeting will be announced in the next issue.

Salesmen and Superintendents in A. P. P. A.

At a meeting of the Executive Committee of the American Paper and Pulp Association held in New York City on July 8th, the Salesmen's Association of the Paper Industry and the American Pulp and Paper Mill Superintendents' Association were officially affiliated with the American Paper and Pulp Association. This gives the parent organization of the industry 18 affiliated organizations and, of course, a considerable number of individual members.

A. W. P. Co. Entertains New York Printers

Two hundred and thirty-five Master Printers of the New York Employing Printers' Association, were the guests of the American Writing Paper Co. on Tuesday, June 22. Their visit to Holyoke was a part of the schedule of the Associations' annual educational trip. The visiting arrangements were so planned that the company's guests were able to visit

Famous OHIO—the World's Best Baling Press

A VIEW of one of the Famous Ohio Paper Baling Presses in the plant of the Robert Gair Co., Paper Products, Brooklyn, N. Y. The machine is connected directly to the scrap bin by a gravity feed, saving handling of the fine scrap. That they are pleased with these Ohio Presses may be seen from their letter.

"We have several of your presses in operation and we have just ordered another from you.

"The presses are giving us excellent service and take great pleasure in recommending them to anybody who desires a press for conditions such as ours, namely, the baling of large quantities of various kinds of scrap with the least possible delay."

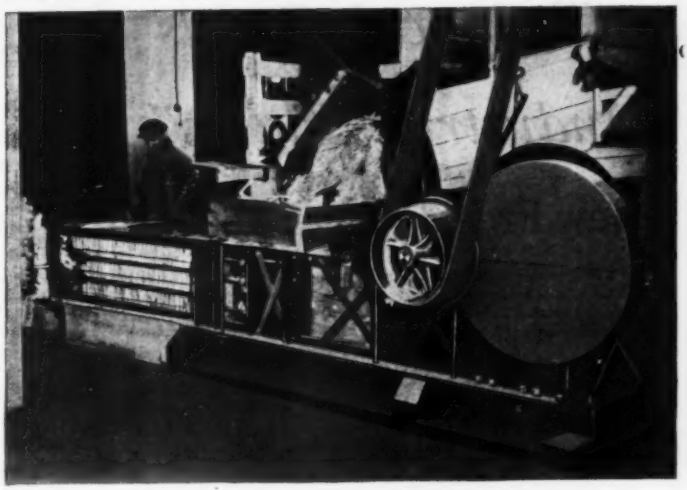
Hundreds of paper makers—handlers and makers of paper products of all kinds—are users of FAMOUS OHIO Paper Baling Presses. What is more, they are glad to say so.

The Famous Ohio Horizontal Type press is superior in design, workmanship and productiveness to any other paper press on the market. It is continuous. It compresses tighter. It is much faster and requires much less labor.

Let us tell you more about it.

The **Ohio Cultivator** *Co.*

Bellevue, Ohio



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Dandy Rolls *Cylinder Molds*

Brass, Copper and Iron Cloth

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This book contains several pages of information on "The Composition of Paints" authentic general information about the various pigments and vehicles used; also about the spraying of paints.

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The Most Reliable List Ever Compiled of
Corrugated & Solid Fibre Container Manufacturers
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Price: Three Dollars

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their two mills, the Linden and the Gill, and the Department of Technical Control, which contains the finest industrial laboratory in the country.

In the evening, a trip to the summit of Mount Tom and a dinner for which an excellent menu was provided was a part of the program. Many interesting addresses were delivered and among them Pres. George A. Galliver in his subject "Looking Ahead" admonished business men to have confidence in the future and that the state of mind which foresaw disaster should be immediately corrected. He believed that our industries are sound and that there will be a long period of prosperity.

Vocational Education Fund

Further contributions to the fund which is being raised by the Joint Vocational Education Committee of the Technical Association of the Pulp and Paper Industry have been received during the month of June and are acknowledged by the secretary-treasurer of the association as follows:

Previously acknowledged	$20,295.27
Paper, Inc., New York, N. Y. (for article on Microscopy of Pulpwoods)	46.25
The Miami Valley Paper Manufacturers Association, Hamilton, Ohio	150.00
J. W. Butler Paper Company, Chicago, Ill.	50.00
Total to June 29, 1920	$20,541.52

Accessions to the membership roll of the Technical Association of the Pulp and Paper Industry announced by the secretary at the end of June number eight corporate and three junior.

New Company to Build Turbines

The Dominion Bridge Co., Ltd., Montreal, Canada, announce the reorganization of their subsidiary, the Dominion Engineering and Machinery Co., which took over the manufacture of paper machinery. An investigation of the possibilities of the new plant revealed the position it is in to manufacture hydraulic as well as paper machinery, and with the extension of output in view, the subsidiary has been reorganized and from now on will be known as the Dominion Engineering Works, Ltd.

Arrangements have been made by the new Company with the William Cramp & Sons Ship and Engine Building Company, of Philadelphia (the I. P. Morris Department), for the exclusive use in Canada and the British Empire of its designs for water turbines and other hydraulic machinery. New equipment has been purchased and is being installed in the shops at Lachine, Quebec, which will make possible the manufacture of the largest turbines and paper machines.

The various paper mill specialties formerly made by the Paper Machinery Department of the Dominion Bridge Company, Limited, and by the Dominion

Jenssen Two-Tower Acid System

56 Installations in operation or under construction on this Continent or Abroad

G. D. Jenssen Company
200 Fifth Avenue
New York

Jenssen Acid Towers at Great Northern Paper Co. Mill at Millinocket, Maine

The Cost of a Paper Machine Wire Can Be Figured Only on the Basis of Service Rendered

1—Rapid strides are being made today in combining materials to produce a result which will give greater service.

2—A metal has been perfected for the manufacture of wires, other than fourdriniers for paper and pulp mills called NICKEL ALLOY.

3—**O'NEILL NICKEL ALLOY** wires have demonstrated by their performance in some of the largest mills of this country, that their life and service show approximately 400% better investment for the pulp and paper manufacturers. Upon request testimonials will be gladly submitted.

4—We recommend that you try the **O'NEILL NICKEL ALLOY WIRES.** They cost more but they are worth it.

5—We also manufacture very durable paper machine wires of brass and bronze in plain, double warp, triple chain, and twisted weaves.

Joseph O'Neill Wire Works
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Felts and Jackets

Manufactured By

APPLETON WOOLEN MILLS
APPLETON, WIS.

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CHIPPER and BARKER KNIVES;
RAG CUTTER, ROTARY CUTTER and PAPER TRIMMING KNIVES,
FLY BARS and BED PLATES for BEATERS and WASHERS,
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JOHN W. BOLTON & SONS, Inc.
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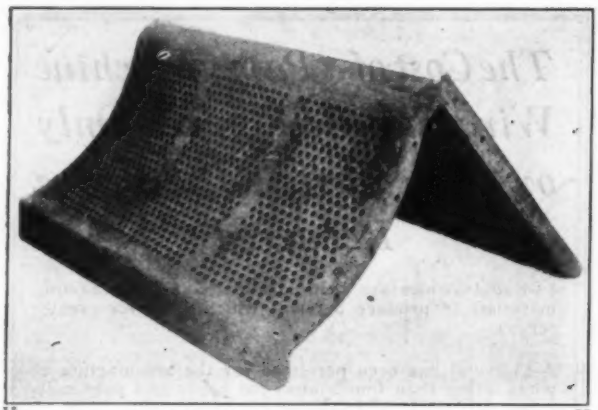
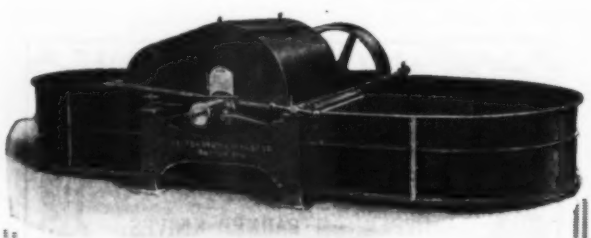
Intensive specialists in the manufacture of uniformly high grade machine knives for the pulp, paper and board industry



Because there are no moving parts this is a very simple but very efficient device. Patent No. 1,271,426 issued to Mr. Brownell Buehler, July 2nd, 1918.

The Shartle Continuous Beater Company
MIDDLETOWN, OHIO



"Dayton" Beating Engines are Built for Heavy Duty

Dayton Beater and Hoist Co.
DAYTON, OHIO

Engineering & Machinery Company, Limited, will henceforth be manufactured by the new Company.

A Successful Suit

The Swenson Evaporator Co., of Chicago, have obtained judgment for the amount of $43,862.00 against the Minnesota and Ontario Paper Co., of International Falls, Minn. Their suit was filed in the U. S. District Court at Minneapolis, early in 1919, for the remaining amount due in accordance with a contract made with the defendant in 1916 and was claimed to be about $40,000.00 and interest.

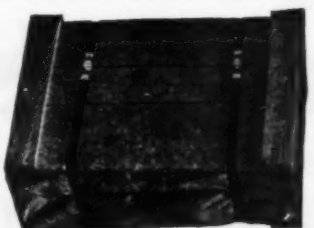
The defendant claimed that this money was not paid as the machinery was not built according to contract and filed a counterclaim for damages to the extent of $700,000.00, this amount being gradually reduced by rulings of the Court to $92,000.00 as representing the maximum amount that could be due the defendant in case the jury decided they were entitled to any damages at all.

The testimony proved according to the verdict reached by the jury that the troubles of the defendant were not due to any faulty design or defect in material as furnished by the plaintiff. It was shown that similar machinery made by the plaintiff was giving excellent service at other pulp mills when operating on similar materials.

An entertaining program has been arranged for the Decennial Celebration of the Forest Products Laboratory at Madison, Wisconsin, on July 22 and 23. The committee hopes that a large number will avail themselves of this opportunity to become better acquainted with this unique and important institution.

The Gibbs-Brower Company, of New York, has negotiated the sale of the Vande Carr Paper Company mill at Stockport Center, N. Y., to E. H. Angier, who will utilize the plant for the manufacture of kraft paper which the Angier Mechanical Laboratories, of Farmingham, Mass., will require in the development of new products they are planning to market. The mill has a capacity of about 18 tons per 24 hours.

SIGNODE SYSTEM



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Signode straps insure delivery of framed paper bundles in the same condition they leave the mill. Cheaper than rope. No battered corners. Liberal trial arrangement.

Write for Particulars and Prices

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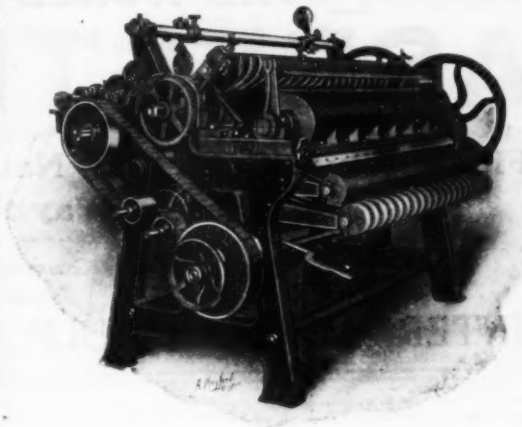
564 W. Adams Street CHICAGO, ILL.

The Stickle Automatic Steam Control for Paper Machines

WE wish to emphasize the word "automatic." This with us means that the steam follows changes that come to the sheet from free to hard drying stock or any ordinary changes in weights. A control that does not do this in itself is not automatic. This makes a better sheet of paper. We guarantee to hold the moisture at any point you wish with ½ of 1% change. Furnished on 60 days' approval.

OPEN COIL HEATER & PURIFIER CO.
INDIANAPOLIS, IND.
BOSTON PHILADELPHIA



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Single, Duplex, and Diagonal

CUTTER KNIVES
PATENT TOP SLITTERS

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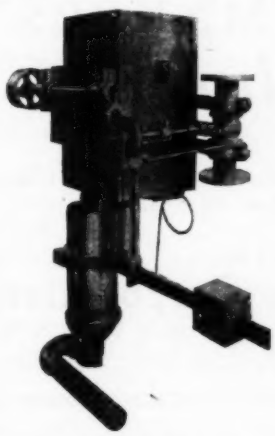

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Glens Falls, N. Y.

New Sand Filter

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This filter gives perfectly clear water, washes thoroughly, does not require renewal of the sand bed, is absolutely reliable in the performance of its duty and requires a minimum amount of attention.

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NEW YORK

The half way mark has been reached and passed and every indication seems to make it doubly sure that 1920 will prove to be the most eventful and prosperous year the paper industry has long, if not ever, experienced. The market continues in a blaze of activity, and while the inevitable mid-summer slowing up is affecting some branches of the industry to an extent, business as a whole is remarkably lively for this season of the year and gives promise of continuing so. Prices are firm in almost every instance. In only one case has there been any visible signs of easiness and in this single direction it is a matter of manipulation by buyers of paper rather than any real falling off of demand. Newspaper publishers throughout the country have decided among themselves to keep out of the spot news print market as much as possible, and with the majority of them living up to this arrangement, demand for spot lots of print paper has decreased and prices have displayed a sagging tendency. In the face of this situation, newspaper publishers, with few, if any, exceptions are leaving out columns upon columns of advertising from almost every issue they print; but simply in the hope of lowering paper costs they are refraining to as great an extent as possible from operating as buyers in the open news print market. On the other hand there is a mad clamor for news print on contract, or rather at the contract prices quoted by mills, and publishers are exerting every effort to secure additional paper supplies in such directions. It will be readily seen, therefore, that although demand for news print has eased off, with a resultant softer price tone, there is a tremendous potential demand remaining unfilled, so that basically the market situation is fully as strong as ever.

It has been most gratifying to paper manufacturers and dealers in common to witness the market for paper rule so firm when nearly every other manufactured commodity has been "shooting the chutes" downward in both price and demand for more than a month. The steadiness of the paper market has been proof ample of its healthiness; moreover it has gone to show that the advance in paper prices in recent months was due solely to the workings of the law of supply and demand in conjunction with heavy increases in cost of production. Commodity markets which were shoved up to high planes by speculative buying quickly toppled when the reactionary movement set in, but today paper prices remain firmly entrenched on the levels prevailing for some time and give every indication of mounting higher in some instances, simply because demand is of sufficient volume to warrant such prices and available supplies are inadequate to fill the wants of consumers.

Possibly the strongest kind of paper at the moment is book papers. Magazine and other periodical publishers are seeking in every corner of the market for further amounts of book papers and are meeting any price within reason when finding supplies available. There is no doubting that most consumers of book paper are short of their probable requirements over the balance of the year, and their single idea is to cover their wants if it is possible to do so. Mills as a general thing are sold out for months ahead, and offerings of surplus lots of any kind of book paper are very nearly a rarity. Prices, as would be expected under the circumstances, are firm, and tending stronger all the while.

Fine papers are in steady demand and rule firm in price. In this particular branch of the industry manufacturers are encountering constantly increasing production costs and they are frequently obliged to raise quotations on their product. Writings of all grades are moving actively, not only for domestic use but also for export, as are ledgers, linens and all other fine papers.

News print in the open market is selling at from 12 cents per pound upward. There are no supplies going abegging, but it is true that demand for spot shipments is a good deal quieter. Wrapping and tissue papers hold steady in price and are sought in consistent fashion by buyers.

The board situation is marked by firmness. Mills are booked far ahead with orders and are devoting their major efforts to keeping contract customers supplied. News board is quoted at a minimum of about $125 a ton at mills and plain chip board is selling for spot delivery at $115.

The contract price basis on news print of the International Paper Company for the third quarter of 1920 has been fixed at $5.75 per 100 pounds for rolls in carload lots f. o. b. mills, an advance from the price prevailing in the second quarter of $15 a ton. The production of the International this year is expected to approximate 300,000 tons of news print, practically all of which has been contracted for in advance. The price covering sales is adjustable quarterly by agreement between the company and newspaper publishers.

The timber from more than 4,000 acres of land in the United States in converted into paper daily.

KRAFT
SULPHITE
BLEACHED **PULP** UNBLEACHED
FOREIGN
DOMESTIC

50 East 42 St.
New York

Inquiries Solicited
Scandinavian-American Trading Co.

Telephones
Murray Hill
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Craig-Becker Co.

Incorporated

52 Vanderbilt Avenue
NEW YORK CITY

Bleached Easy Bleaching
Unbleached Sulphites

Spruce and Poplar Ground
Wood Pulp

Domestic *Export*

BATHURST LUMBER COMPANY, LIMITED

PRICE & PIERCE, LTD.
30 East 42nd Street, NEW YORK CITY

ARE NOW THE

SOLE SELLING AGENTS
for Bathurst Pulp

Unbleached Sulphite 50 tons daily
Kraft Pulp 50 tons daily

Our pulp is made from Canadian Spruce
We ship in sheets, baled

BATHURST, NEW BRUNSWICK, CANADA

Bleached and Unbleached
WOOD PULP
of Every Description
M. GOTTESMAN & COMPANY
INCORPORATED
18 East 41st Street **NEW YORK, N. Y.**
Established 1886

Papermaking Rags

An easier tone has developed in the papermaking rag market and prices on most grades have declined. Mills are following their usual policy for this time of the year and are buying only against immediate requirements, and the market is in a typical summer condition. There is every reason to believe, however, that most paper manufacturers will not wait until the fall to commence laying in stocks of rags, as they invariably do, but will resume active buying within the next few weeks, and dealers argue that in this event prices will surely go back to the levels prevailing up to a short while ago. Fundamentally the rag market is decidedly strong. As far as can be ascertained, there are no large accumulations in any part of the country, and authoritative members of the trade declare that receipts of mixed rags from spring collections the country over did not begin to approximate in volume those of normal years. This would seem to be credited by the prevalence of rag prices on high levels during the spring months. It is also contended that rags from foreign sources are coming forward in smaller amounts and that every indication points to a material falling off in imports during the next few months.

The sharpest decline in prices has occurred in roofing rags, which are selling at an average of about 2.75 cents a pound at shipping points, representing a drop of a half to three-quarters of a cent per pound. Old whites also are lower at a quotable basis of 14 to 15 cents, while thirds and blues are available at 4.50 cents, against a previous price of 5 cents. New cuttings hold steady, this being due not to any big demand from mills but to the slow operations of clothing houses and the resultant small quantities of new rags being produced. Dealers are generally unwilling to part with present stocks except at full prices and in frequent cases ask higher figures. No. 1 white shirt cuttings are quoted at 21 cents and higher, washables at 11 cents, white lawns at 19 cents and muslins at 17 cents. Quotations f. o. b. shipping points are:

New Stock—	New York and Chicago
White shirt cuttings, No. 1	21.00-21.50
White shirt cuttings, No. 2	13.50-14.00
Fancy shirt cuttings	12.50-13.00
Washables, No. 1	11.00-11.50
Unbleached muslins	17.00-17.50
White lawns	18.50-19.00
Overall cuttings, blue	13.00-13.50
Black silesias	7.50- 8.00
Old Stock—	
Whites, No. 1 repacked	14.00-15.00
Whites, No. 2 repacked	7.50- 8.00
Whites, house soiled	4.50- 4.75
Whites, street soiled	4.25- 4.50
Thirds and blues, repacked	4.50- 4.75
Thirds and blues, rough	4.00- 4.25
Black stockings	4.50- 4.75
Lace curtains	9.25- 9.50
Cotton canvas, No. 1	5.50- 6.00
White cotton batting	4.75- 5.00
Roofing, No. 1	2.70- 2.80
Roofing, No. 2	2.60- 2.70

Rope and Bagging

After scoring a sharp decline of about a cent per pound, prices on old rope have steadied at the revised basis and there is a fairly good business passing at present. Paper mills are securing No. 1 Manila rope at around 7.50 cents, against a former price of 8.50 cents and more, and appear to be experiencing no difficulty in covering their wants at the newly established market level. Old bagging is in a condition bordering onto dormancy. There is but a retail demand, important consumers being almost entirely out of the market, and those buyers operating are getting supplies at very much their own figures. No. 1 scrap bagging is freely available at 3.25 cents a pound at shipping points and less, while roofing bagging has sold down to 2.25 cents. Gunny is easy and moving chiefly on contract. Quotations follow:

	New York and Chicago.
Gunny, No. 1 domestic	3.40-3.60
Gunny, No. 1 foreign	3.40-3.60
Scrap bagging, No. 1	3.15-3.30
Roofing bagging	2.25-2.50
Wool tares, heavy	3.75-4.00
Wool tares, light	3.50-3.75
Manila rope, No. 1 foreign	7.25-7.50
Manila rope, No. 1 domestic	7.25-7.75
Sisal strings	3.40-3.60
Mixed strings	3.10-3.25

Old Papers

Besides wood pulp, waste paper is the strongest raw material used by papermakers in the market today. The active demand for old paper is of course largely due to the scarcity of pulp, and the consistently heavy buying by mills has put prices on

PAPER RAGS

SAVE MONEY

Consult a Specialist for Your Requirements Who Can Supply Your Demand

MARTIN SPINELLI
Paper Manufacturers' Supplies
132 NASSAU STREET NEW YORK

Wire at my Expense for Quotations on 100 or 1000 Tons for Quick Deliveries

BAGGING

BRANCH OFFICE: SPRINGFIELD, MASS.

ROPE

Paper Stock

Established 1885

Last year the combined plants of the Mendelson Bros. Paper Stock Co. handled an average of 300 tons of paper stock every day. Business expanded to an unheard-of degree.

Why?

BECAUSE—the Mendelson organization is efficient, trustworthy and capable of handling this business. Since 1885 we have specialized in one thing until today we are recognized as one of the most reliable sources of supply for paper manufacturers.

BECAUSE—Our aim in conducting business is prompt shipments, correct service, and taking orders only that we can fill, and to pack only a clean uniform product throughout.

Due to recent expansions we are now prepared to take on a large volume of additional tonnage. If you are a paper manufacturer who can use any of our forty different grades of paper stock, we want you to become another of our satisfied connections.

Write, Phone or Wire

Mendelson Bros. Paper Stock Co.

Gen. Offices: 910 S. Michigan Ave., CHICAGO

Long Distance Phones: Harrison 2840 and 5557

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most grades on new high levels. As an illustration of the record-breaking values being secured for old paper can be mentioned one particular grade of this commodity. Transactions have been recorded in white blank news cuttings at the unprecedented figure of 5.25 cents a pound at shipping points, which level is more than twice as much as newsprint in standard rolls sold for prior to the war. Old kraft paper stock is selling at practically the same prices new kraft wrapping paper at one time commanded, while old newspapers are today worth close to what newsprint manufacturers used to receive for their product from newspaper publishers.

Shavings are a strong item and hard white shavings of No. 1 quality are selling at 8 cents and No. 1 soft white shavings at 7 cents. Even at these prices offerings are light, dealers claiming to be getting but limited amounts from print shops. No. 1 mixed paper rules firm at a quotable basis of around 1.90 cents per pound f. o. b. shipping points and flat folded newspapers are bringing 2 to 2.10 cents. Book stock is the only easy grade in the list and revised quotations range around a basis of 3.35 cents for No. 1 heavy books and magazines. Quotations f. o. b. shipping points are:

	New York and Chicago.
Hard white shavings, No. 1	7.75-8.00
Hard white shavings, No. 2-3	6.50-6.75
Soft white shavings	6.75-7.00
Colored shavings	4.25-4.50
Heavy book, No. 1	3.25-3.50
Crumpled, No. 1	2.75-3.00
Ledger stock	4.00-4.25
Kraft, No. 1	5.00-5.25
Manilas, No. 1	2.75-3.00
White blank news	5.15-5.25
Overissue news, No. 1	2.30-2.40
Folded news	2.00-2.10
Mill wrappers	2.00-2.15
Box board cuttings	1.90-2.00
Mixed paper, No. 1	1.85-1.90
Common paper	1.40-1.50

Chemical Pulp

Quotations on chemical wood pulp continue to mount at a merry clip. Demand is of an urgent character and a large part of it is going unfilled for the reason that producers simply are unable to satisfy the wants of buyers. Offerings of pulp in the open market are very nearly nil; manufacturers do not have to look for buyers these days, consumers come to them for tonnages that cannot be supplied. Under the circumstances, spot lots of pulp are commanding high premiums, with the result open market prices have been shoved up to a point where in some instances sales are being made to transient buyers at double what pulp is bringing on contract. How much longer the "bull" movement in pulp

We are prepared to deliver promptly
in any desired quantity
the following:

Auramine	Bismarck Brown
Basic Green	Pulp Colors
Chrysoidine R	Vegetable Tallow
Chrysoidine Y	Casein
Methyl Violet	Soda Ash
Orange	Caustic Soda
Basic News Blue	Bleaching Powder
Stearate of Calcium	Stearate of Alumina

A. Klipstein & Company
644-652 Greenwich St., New York
Philadelphia Boston Providence
Charlotte Chicago Montreal

China
CLAYS
ENGLISH *and* DOMESTIC
for every purpose

The
JOHN W. HIGMAN
COMPANY
29 Broadway New York, N. Y.
Western Representative: CALE B. FORSYTHE
KALAMAZOO, MICHIGAN

E. J. KELLER COMPANY
INCORPORATED
200 FIFTH AVENUE
NEW YORK
FOREIGN AND DOMESTIC
PAPER MAKERS' SUPPLIES
COTTON, JUTE AND FLAX WASTES
COTTON BAGGING MATERIALS
EAST INDIA MERCHANDISE

J. ANDERSEN & CO.
FREDERICK BERTUCH, SPECIAL PARTNER
21 East 40th Street, New York City
Importers of Chemical Pulps
BLEACHED AND UNBLEACHED
Agents for Kellner Partington Paper Pulp Co., Ltd.
Sarpsborg, Norway; Forshaga, and Edsvalla, Sweden;
Bergvik and Ala Nya Aktiebolag, Söderham, Sweden

F. G. MARQUARDT, President
HUGO THUM, Vice-Pres. CHAS. E. RAND, Secy.
A. D. LORENZ, Treasurer
F. G. Marquardt, Inc.
PAPER
and
Paper Makers' Supplies
345 Broadway, New York City
Packing House
ROCKVILLE CENTRE
NEW YORK
Special Attention Called to Our Own Packing and Assortment

We
are
Manufacturers
and
Exporters
of
PAPER
also
Importers
and
Jobbers
MAURICE O'MEARA CO.
448-50 Pearl Street NEW YORK CITY

SALOMON BROS. & CO.
Importers and Exporters of
Cotton, Cottonwaste, Linters,
Ramie, Jute, Rubber
Import of All Grades of Rags and Rope
200 Fifth Ave.. NEW YORK

DANIEL M. HICKS
INCORPORATED
IMPORTERS-DEALERS
ESTABLISHED 1895
Foreign and Domestic
Rags, Bagging, Rope
and Waste Paper
200-5th AVENUE, NEW YORK CITY

prices will continue is problematical, but it can be said that there are as yet no indications that the market has touched top levels. On the contrary, unless something happens effecting a more equalization of supply and demand, values give promise of going to new record-breaking heights.

News print sulphite has sold at 8.50 cents per pound at pulp mills and is difficult to secure in sizable tonnage at this price. Domestic bleached sulphite is quoted in the open market at a minimum of 12 cents, and quotations up to 14 cents have been recorded. Easy bleaching sulphite is readily selling at 10 cents and more when available for spot shipment, while kraft pulp has sold at 7.50 cents. F. o. b. producing mills quotations on domestic pulps follow:

Bleached sulphite	12.00-14.00
Easy bleaching sulphite	10.00-10.50
News grade sulphite	8.00- 8.50
Soda pulp, bleached	8.50- 9.00
Mitscherlich unbleached	9.00- 9.50
Kraft, No. 1	7.50- 7.75
Screenings, refined	3.00- 3.25

Mechanical Pulp

While the market for sulphite pulp is strong, that for ground wood is stronger. By leaps and bounds prices on mechanical pulp have advanced until they prevail on heights which are truly surprising. There have been sales of spruce ground wood of prime quality for prompt delivery at $150 per ton at producing mills, and buyers in want of supplies and willing to pay this figure are finding it next to impossible to locate available stocks. The truth of the matter is that grinders have liquidated their surplus holdings and have virtually their entire current output sold on contract. The few limited-sized lots coming into the open market consequently are selling at almost any price that may be asked. Bids of $130 and $140 scarcely receive the attention of sellers, who evidently are fully aware that higher prices can be obtained in other directions for such pulp as they have to dispose of.

Chemicals

A strong demand prevails for bleaching powder and producers are insistent on premiums for spot shipments, 6 cents and more being quoted in most cases. Other papermaking chemicals are quotably firm and are moving in steady fashion toward consumers. Quotations are:

Alum, lump ammonia	4.25- 4.50
Alum, lump starch	8.50- 9.00
Alum, powdered	4.75- 5.00
Blanc fixe, powdered	5.50- 6.00
Bleaching powder (domestic drums)	6.00- 6.25
Brimstone (ton)	18.00-20.00
Casein	14.00-16.00

Largest producers in the world of highest grade Brimstone —guaranteed 99% pure—free of Arsenic and Selenium.

The
UNION SULPHUR COMPANY

In so far as possible we will be glad to offer advice or suggestions to prospective buyers who are using or may be contemplating the use of brimstone.

17 BATTERY PLACE
NEW YORK

¶ Are you receiving all the Clay you need and the grade that you want? Or are you accepting any old grade just so long as you can get delivery.

¶ Our customers are receiving the same grade as usual and do not even know there is a shortage.

¶ We are in a position to give this same Service to you on

Washed Clay

Because—

QUANTITY: Largest production in United States.

QUALITY: Lowest grit and moisture contents of any clay, domestic or foreign.

DELIVERIES: Reserve stock always on hand.

PLANTS: Three huge plants at McIntyre, Ga., under direct control of Edgar Bros. Co., also Saylorsburg, Pa., and Gordon, Ga.

CRUDE CLAY: Paragon and Excelsior Brands.

MINER-EDGAR CO.
30 Church St. New York

TRY US ON WOOD PULP

Mechanical Ground Wood
Unbleached Sulphite
Bleached Sulphite

American, Canadian & Foreign Qualities

Invincible Paper and Pulp Corporation
A. GEORGE LUTZ, *President*
135 Broadway New York City
Long Distance Phone, Rector 9957

The Pulp and Paper Trading Co.
21 East 40th Street New York City
Dealers in Domestic Chemical and Mechanical Pulps and Paper
AGENTS FOR
J. & J. Rogers Company, Au Sable Forks, N. Y.
Canadian Kraft, Ltd.
Dealers in Wayagamack Kraft
Three Rivers, Canada
EASTERN AGENTS FOR
Port Huron, Michigan, Mitscherlich Sulphite
Made by Port Huron Sulphite & Paper Co., Port Huron, Mich.

J. A. & W. BIRD & CO.

CASEIN

Satin White
All Kinds of Casein Solvents
Clay

88 Pearl St. BOSTON, MASS.

Main Paper Stock Co.
Incorporated
PACKERS OF WASTE PAPER STOCK
Old and New Rags, Bagging, Strings, Etc.
Importers—Exporters
Daily Capacity 300 Tons
Branches: 311 Pearl Street, 423 East 122nd St.
General Offices and Warehouses: 25-31 Peck Slip, New York
Boston (Mass.) Office— 10 High St.
Holyoke (Mass.) Office—206 High St.

FRANCIS HUGHES COMPANY
Paper Mill Supplies
CORRESPONDENCE SOLICITED
Private Switch on C. B. & Q. Tracks
21st Street at Loomis
CHICAGO, ILLINOIS

Caustic soda, spot delivery	6.50- 6.75
China clay, domestic, washed	10.00-13.00
China, clay, foreign	18.00-24.00
Rosin, grade E	18.75-
Satin white	2.75- 3.00
Soda ash, 58 per cent light (bags)	3.00- 3.50
Sulphite of alumina, commercial grade	2.00- 2.50
Starch, Globe, in bags	5.47-
Talc (ton)	18.00-20.00

Death of Henry Atterbury

Henry Atterbury, president of Atterbury Brothers, importers of and dealers in papermakers' supplies of 145 Nassau street, New York, died at his home in Summit, N. J., several weeks ago. Mr. Atterbury was born in Brooklyn, N. Y., in 1848, and started in the paper business soon after leaving school with Buchanan, Perkins & Goodwin, which concern is today known as the Perkins-Goodwin Company. Later he founded, with his brother the late Robert B. Atterbury, the firm of Atterbury Brothers, and was actively identified with the business until a few days prior to his death. He enjoyed a wide acquaintanceship among paper manufacturers the country over.

A Progressive Company

The Hollingsworth & Vose Company may be numbered with those progressive concerns who are seeking to benefit the towns in which their mills are located by taking active part in various community activities.

Wednesday, June 23, the above company opened a first class moving picture house in West Groton, Mass., where they have a three machine mill employing about 250 people. It is planned to run only high class films having both entertaining and educational features.

An Athletic Association has been formed, and the boys are arranging games to be played mostly on the grounds provided by the company on land near the mill.

In common with many others this concern has a "Housing Problem," and they are meeting it squarely with a building program which has for its basis the erection of six small houses for the laborers, and several larger ones for the more skilled workmen.

Quite an extensive addition to the office is now being erected in which will be provided a very complete hospital with a graduate nurse in attendance who will give immediate emergency treatment to any one in the mill requiring it, and who will be ready to co-operate with other authorities in any matters beneficial to the public health.

The Hollingsworth & Vose Company is a large producer of rope and jute specialties of the highest grade with a production of over 100,000 lbs. per day from the East Walpole and West Groton Mills.

THE ROBERT ANDREWS CO.
115-117 Franklin Street, New York
Paper Makers' Supplies
Flax Waste
Italian Hemp Waste
Flax Spinners Waste
Linen Thread Waste
Linen Cuttings
Jute Waste
Samples and Quotations on Request

STANDARD BLEACHING POWDER
Manufactured by
Pennsylvania Salt M'f'g Co.
PHILADELPHIA, PA.

Have You Tried Cotton Linters for Paper Stock?
It Will Pay You to Figure With Us
Our organization covers the South
Steele By-Products Co., Inc.
DEALERS IN
Cotton—Linters—Waste
GENERAL OFFICES AND WAREHOUSES
BIRMINGHAM, ALABAMA
305-6 Slaughter Bldg. DALLAS, TEX.
1013 Hearst Bldg., CHICAGO, ILL.

Bardeen Paper Co.
Otsego, Mich.

Printing Papers of Merit

For LETTERPRESS, OFFSET *and* LITHOGRAPHIC PRINTING

Offset Blanks Offset Bristols

Porcelain, Peninsular and Purity Enamel Book

M.F. and S&SC Book and Catalog

English Finish Opaque

Coated Blanks
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BERMINGHAM & PROSSER CO.
Kalamazoo, Michigan

PAPER Distributors

Let us submit an estimate on your next

Catalog
Booklet
Broadside
or Magazine

MAKE THE HANDLING OF

Parchment
Profitable to You

¶We have prepared Samples, put up in neat cartons, for the Jobbing Trade.

¶If you have not received a set we will gladly send one.

ALSO
Special Price Lists
FOR YOUR SALESMEN

SUTHERLAND PAPER CO.
Makers of
Pure Vegetable Parchment
KALAMAZOO MICHIGAN

WOLVERINE Paper Company

"Wolverine' Waxed Papers for Every Requirement

Best Quality

Waxed Tissue a Specialty

OTSEGO, MICHIGAN

New Papers

Writing—	
White rag	30-50
White sulphite, No. 1	18-24
Colored	20-30
Ledger—	
White rag	30-55
White sulphite	20-30
Colored sulphite	22-
Colored rag	32-
Bonds—	
White rag	20-50
White sulphite	18-30
Colored sulphite	20-30
Colored rag	22-
Book—	
No. 1 S. & S. C	16.00-18.00
Machine finished	15.00-16.00
English finished	17.00-19.00
Coated and enameled	18.00-20.00
Lithograph, M. F	19.00-20.00
News Print—	
Rolls, contract	5.50- 6.00
Rolls, transient	12.00-
Sheets	Nominal
Side runs	7.00-
Cover Stock—	
Coated, both sides	12.25-
Coated, one side	12.20-
Wrappings—	
No. 1 kraft	11.50-12.00
No. 2 kraft	10.50-11.50
Boards—	New York and Chicago
Solid news	125.00-135.00
Straw	100.00-110.00
Plain chip	115.00-120.00
White coated chip	130.00-140.00
Manila coated chip	125.00-135.00
Binders board	135.00-150.00

At a recent meeting of the Stoker Manufacturers' Association held at Lakewood, New Jersey, the following officers and Executive Committee were appointed: Sanford Riley, President; M. Alpern, Vice-President; A. G. Pratt, Treasurer; S. A. Armstrong, and H. A. Hatton, J. G. Worker, Secretary. President Sanford Riley remarked after the meeting that the government has now become the leading propagandist in the art of conserving fuel, and the need for stokers is being enlarged every day by economic pressure.

News Personals

Clarence Millhiser, president of the Bedford Paper & Pulp Company, of Richmond, Va., who died at his home at 270 Park avenue, New York, on May 20, 1919, left an estate valued at $5,504,800, according to an appraisal just announced. The bulk of the estate, which consisted mainly of stocks of the paper company of which Mr. Millhiser was at the head, was willed to his widow and two daughters.

The firm of F. G. Marquardt, Inc., dealers in paper and paper mill supplies, of 345 Broadway, New York, has increased its capital stock from $75,000 to $300,000.

J. F. Patton, president of J. F. Patton & Company, Inc., paper and pulp mill agents of 33 West Forty-second street, New York, sailed for Europe on July 3 to investigate the paper and pulp markets on the other side of the Atlantic.

Ben R. Hodes, for a number of years associated with the Seaman Paper Company, of Chicago and New York, in its New York offices, has entered business under the firm name of B. R. Hodes Company with offices at 31 Union Square, New York.

E. Salomon, president of A. Salomon, Inc., importers of paper mill supplies, of 15 Park Row, New York, sailed for Europe several weeks ago to spend several months in France and other countries investigating conditions in the papermaking rag markets there.

Frederick H. Gledhill, for several years associated with the paper mill supply firm of Edwin Butterworth & Company in its New York office at 1123 Broadway, died at his home in Hackensack, N. J., on July 4 after a short illness. Mr. Gledhill was about 40 years old and had been identified with the paper stock industry for more than twenty years, principally as road salesman for several well known concerns. He had a wide circle of close friends among mill men.

Offices of the Cost Association of the Paper Industry were moved on July 1 from 18 East Forty-first street to Suite 608 in the Columbia Bank Building, 507 Fifth avenue, New York, where larger and very conveniently located quarters have been secured.

WANTED

Thoroughly experienced storekeeper for pulp and paper mill in Northern Ontario. Must be conversant with paper and pulp machinery parts. Reply giving details of training, experience, salary expected. Also send small photo. Address Box 15, The Paper Industry.

Export Only

All Grades of PAPER and BOARDS

A. M. Capen's Sons
Incorporated
60 Pearl Street
New York City

Established 1870

Premier Shipping Co.
INCORPORATED
32 Broadway, New York

Freight Contractors
AND
Forwarding Agents
Customs Brokers

Specializing in Handling of Export and Import Shipments of Paper

Members of
Steamship Freight Brokers' Assn. of the Port of New York
Produce Exchange, N. Y.
Maritime Exchange
Swedish Chamber of Commerce

Hart Trading Company, Inc.

TRIBUNE BUILDING, NEW YORK

Paper Mill Agents

EXPORTERS and IMPORTERS
PAPER PULP

BRANCH OFFICES
Chicago Rio de Janeiro Buenos Aires Valparaiso

30 Years Exporting American Paper

Our Markets: The World outside of U. S. A. and Canada.

Our Organization: Ten selling offices, besides salaried travellers and local representatives.

Our Demand: An established clientele, constantly being increased, by an aggressive sales policy.

Our Supply: **Your Mill?**

Present conditions in America are temporary.

Have you considered what a first-class export outlet would mean to you, with its assurance of **steady** demand?

Parsons Trading Company

17 Battery Place **NEW YORK**

London
Stockholm
Sydney
Melbourne
Wellington
Bombay
Mexico, D. F.
Havana
Buenos Aires
Rio de Janeiro

Chemical Pulp

A very tight supply condition is still the outstanding characteristic of the imported wood pulp market. Little or no pulp of any kind is available on the spot in this country for the reason that importers have practically depleted their unsold holdings and are disinclined to bring in supplies from Scandinavia excepting for the account of contract customers. Prices on all grades of pulp in Norway, Sweden and Finland are on excessively high levels. Strong demand from England and other European countries has run pulp values on the other side of the Atlantic to heights where they are considerably beyond a parity with market prices here, in consequence of which importers have, for the time being, discontinued their practice of bringing supplies to America on their own behalf to be disposed of here to paper manufacturers. Such amounts as are being received are sold long before they arrive, the bulk of Scandinavian pulp now being imported being bought by consumers in the United States for shipment from producing centers. There are occasional offerings of foreign kraft on the spot at New York or Baltimore, but these seldom involve large tonnages and firm prices are demanded in every case. Prices on bleached sulphite are mainly nominal as most mills on the other side are sold out and have nothing to offer for some time. Strong unbleached sulphite also is difficult to secure in sizable volume irrespective of the prices consumers bid, and easy bleaching sulphite is scarce. Receipts at New York during June and current nominal quotations follow:

Bleached sulphite	$14.00-
Unbleached sulphite, No. 1	10.00-11.00
Easy bleaching	10.50-11.00
Mitscherlich unbleached	11.00-11.50
Kraft	8.00- 8.25

Equitable Trust Co., 250 bls. from Rotterdam; Irving National Bank, 508 bls. from Gothenburg; Scandinavian-American Trading Co., 3,433 bls. from Gothenburg; E. M. Sergeant & Co., 240 bls. from Christiania; Tidewater Paper Mills Co., 15,389 bls. ground wood from Liverpool, N. S.

Paper Stock

The outstanding development in the imported paper stock market is the placing of an export embargo on all kinds of rags by the French Government. Whether or not this means the cutting off of France temporarily as a source of supply of papermaking rags for the United States has not been fully determined, but present advices are that the embargo will be strictly enforced. Arrivals during the past month of all kinds of foreign papermaking material have been of good volume. Rags in particular have come in in large amounts, and sizable tonnages of old rope and bagging have been imported. Receipts at New York during June follow:

Old Rope

Irving National Bank, 152 bls. from Copenhagen; W. Schall & Co., 27 bls. from Bordeaux, 23 coils from Belfast, 154 coils from Hull; National City Bank, 204 bls. from Rotterdam; International Purchasing Co., 25 coils from Glasgow, 237 coils from Rotterdam, 66 coils from Christiania, 1,680 coils from Hull; E. J. Keller Co., 415 coils from Rotterdam, 51 coils from Hull; Old Colony Trust Co., 243 coils from Bristol, 51 bls. from Antwerp, 234 bls. from Havre, 175 coils from Leith; Mechanics & Metals National Bank, 40 coils from Bristol; Hollingsworth & Vose Co., 65 bls. from Barcelona; W. H. Cummings & Sons, 315 coils and 18 bls. from Gothenburg; George W. Millar & Co., 168 coils from Antwerp; Equitable Trust Co., 392 bls. from Antwerp; Edwin Butterworth & Co., 140 bls. from Antwerp, 50 bls. from Havre; Heidelbach, Ickelheimer & Co., 141 bls. from Havre; International Banking Corp., 8 coils from Panama; First National Bank of Boston, 643 coils from Hull; Order, 242 bls. from Rotterdam.

Old Bagging

Parsons & Whittemore, 3 bls. from Havre; National City Bank, 297 bls. from Antwerp, 450 bls. from Havre; First National Bank of Boston, 50 bls. from Bordeaux; Comptoir National d'Escompte, 18 bls. from Bordeaux, 68 bls. from Antwerp; E. J. Keller Co., 438 bls. from Rotterdam; International Banking Corp., 231 bls. from Manchester; Ladenburg, Thalman & Co., 40 bls. from Havre, 1,127 bls. from Rotterdam; Edwin Butterworth & Co., 60 bls. from Barcelona; Main Paper Stock Co., 49 bls. from Rotterdam; R. F. Downing & Co., 128 bls. from Rotterdam, 96 bls. from Antwerp; Brown Bros. & Co., 32 bls. from Antwerp; Northwestern Metal Selling Co., 100 bls. from Rotterdam; Castle, Gottheil & Overton, 280 bls. from Antwerp; Goldman, Sachs & Co., 47 bls. from Antwerp, 76 bls. from Havre; Equitable Trust Co., 58 bls. from Antwerp, 342 bls. from Havre; Mechanics & Metals National Bank, 449 bls. from Rotterdam; Atlantic National Bank, 143 bls. from Hull, 89 bls. from Havre; Wilkinson Bros. & Co., 13 bls. from Hull; Heidelbach, Ickelheimer & Co.,

Foreign and Domestic

PATENTS AND TRADEMARKS

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Infringements, Titles, Searches. WE SPECIALIZE IN PATENTS RELATING TO THE PAPER MAKING INDUSTRY. All members of our firm are Law School graduates and have had more than 10 years' Patent experience.

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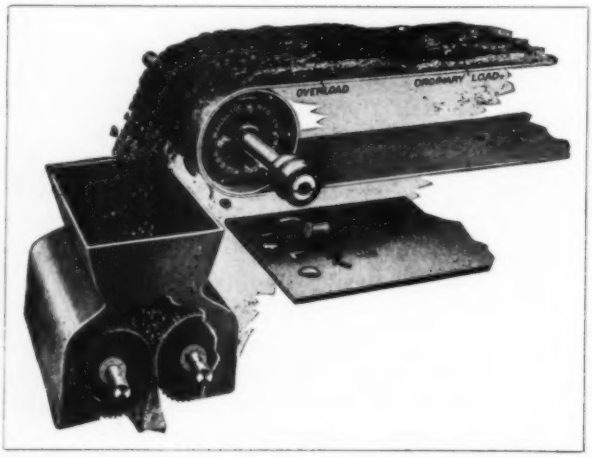

All paper stock should be run over one of our Magnetic Separators before going to the dusters. This would remove everything in the shape of metal, and thereby prevent these pieces from going into the stock, which cause considerable trouble, and ruined wires or felts.

Let us tell you more about the advantages of using one of these machines

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STATE PULP & PAPER COMANY, Inc.

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With Flexible Blades, Universal Adjustment and Control (PATENTED)

WARREN IMPROVED PATENT DOUBLE DRUM WINDERS

Patent BALL VALVE Hydrant Stock Circulating Systems *and* other Paper Mill Specialties

SEND FOR OUR BULLETIN

460 bls. from Havre; American Foreign Banking Corp., 143 bls. from Havre; Dallas Waste Mills, 65 bls. from Havre; W. Schall & Co., 91 bls. from Havre; Order, 802 bls. from Antwerp, 587 bls. from Rouen, 159 bls. from Dundee.

Rags

Edwin Butterworth & Co., 35 bls. from Havre; George W. Millar & Co. 100 bls. from Rotterdam; Parsons & Whittemore, 335 bls. from Rotterdam, 533 bls. from Havre; Gatti-McQuade Co., 136 bls. from Rotterdam; Castle, Gottheil & Overton, 214 bls. from Rotterdam, 122 bls. from Antwerp, 256 bls. from Bordeaux, 10 bls. from Hull; E. Gross & Co., 13 bls. from Rotterdam; Kelly & Co., 85 bls. from Rotterdam; Jaffe & Co., 42 bls. from Rotterdam, 56 bls. from Havana; Gotham Paper Stock Co., 193 bls. from Rotterdam; Main Paper Stock Co., 35 bls. from Bordeaux; A. Salomon, Inc., 640 bls. from Havre; E. J. Keller Co., 28 bls. from Bordeaux, 185 bls. from Lisbon, 180 bls. from Barcelona, 44 bls. from Rotterdam, 90 bls. from Havre; J. Salman, 114 bls. from Bordeaux; Maurice O'Meara Co., 594 bls. from Bordeaux, 59 bls. from Rotterdam; W. Hughes & Co., 66 bls. from Bordeaux, 103 bls. from Rotterdam, 58 bls. from Havre; American Woodpulp Corp., 103 bls. from Hamburg; Salomon Bros. & Co., 241 bls. from Rotterdam; A. Katzenstein, 164 bls. from Antwerp; Middleton & Co., 152 bls. from Antwerp; Paul Berlowitz, 1,024 bls. from Havre; R. Goldstein & Son, 639 bls. from Havre; New Netherland Bank, 393 bls. from Antwerp; Citizens National Bank, 744 bls. from Antwerp, 116 bls. from Hull; Mechanics & Metals National Bank, 44 bls. from Antwerp, 190 bls. from Havre, 26 bls. from Hull, 87 bls. from Leith; Dallas Waste Mills, 93 bls. from Rotterdam; National City Bank, 945 bls. from Antwerp, 134 bls. from Rouen; Atlantic National Bank, 52 bls. from Bordeaux; International Banking Corp., 740 bls. from Antwerp; American Foreign Banking Corp., 192 bls. from Bordeaux, 75 bls. from Antwerp; Guaranty Trust Co., 104 bls. from Belfast, 1,160 bls. from Rotterdam, 209 bls. from Antwerp; First National Bank of Boston, 151 bls. from London, 255 bls. from Havre, 1,385 bls. from Hull; Equitable Trust Co., 127 bls. from Rouen, 416 bls. from Havre; Foreign Trade Banking Corp., 17 bls. from Rotterdam; Garfield National Bank, 164 bls. from Rotterdam; Standard Bank of South Africa, 188 bls. from Antwerp, 179 bls. from Havre, 151 bls. from Leith; Goldman, Sachs & Co., 376 bls. from Bordeaux, 548 bls. from Antwerp; Ladenburg, Thalman & Co., 491 bls. from Havre, 383 bls. from Rouen, 675 bls. from Rotterdam, 148 bls. from Antwerp; R. F. Downing & Co., 174 bls. from Barcelona, 411 bls. from Rotterdam, 68 bls. from Antwerp; Heidelbach, Ickelheimer & Co., 154 bls. from Rotterdam; W. Van Doorn, 42 bls. from Roterdam; Brown Bros. & Co., 39 bls. from Antwerp; Davies, Turner & Co., 112 bls. from Ant-

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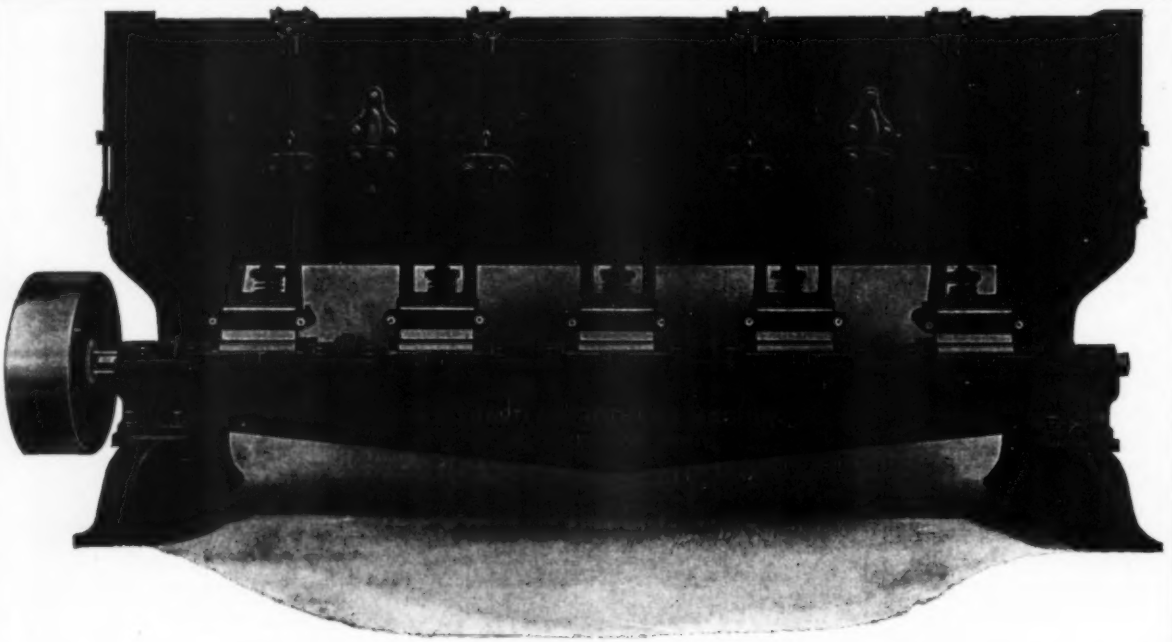

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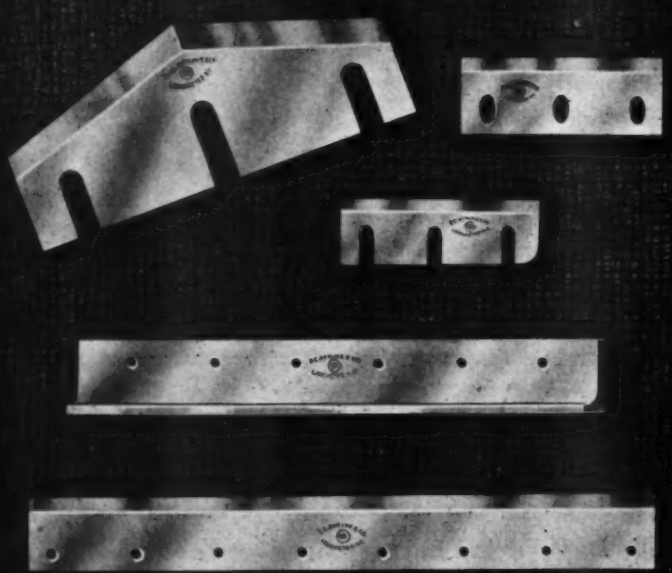

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werp; W. Schall & Co., 367 bls. from Antwerp; Irving National Bank, 891 bls. from Havre; Albion Trading Co., 33 bls. from Bordeaux; American Express Co., 897 bls. from Antwerp; Order, 1,288 bls. from Bordeaux, 596 bls. from Havre, 884 bls. from London, 1,138 bls. from Antwerp, 105 bls. from Alexandria, 23 bls. from Hull.

Miscellaneous Paper Stock

Mechanics & Metals National Bank, 124 bls. from Antwerp; Irving National Bank, 558 bls. from Belfast, 44 bls. from Manchester, 31 bls. from Dundee; American Exchange National Bank, 209 bls. from Belfast; First National Bank of Boston, 32 bls. from Manchester; American Express Co., 147 bls. from Belfast; J. B. Moors & Co., 73 bls. from Glasgow; Baring Bros. & Co., 47 bls. from Glasgow; Edwin Butterworth & Co., 255 bls. from Belfast, 34 bls. from Glasgow, 226 bls. from Rotterdam; Castle, Gottheil & Overton, 90 bls. from Belfast; Bird & Son, 187 bls. from Glasgow; National City Bank, 250 bls. from Antwerp; Ladenburg, Thalman & Co., 178 bls. from Antwerp; Equitable Trust Co., 47 bls. from Antwerp; W. Hughes & Co., 22 bls. from Liverpool; Order, 301 bls. from London, 155 bls. from Dundee.

Paper

Cigarette paper from France and hanging paper from England still constitute the bulk of foreign paper supplies coming into the United States. Receipts of the former have been unusually heavy recently, consignments of as large as 600 cases having been received by the different tobacco companies. There is no especial feature otherwise to paper importations at present, which are considerably below pre-war levels. Arrivals at New York during June were:

Cigarette

Globe Shipping Co., 50 cs. from Antwerp; R. J. Reynolds Tobacco Co., 516 cs. from Bordeaux; P. J. Schweitzer, 30 cs. from Bordeaux, 176 cs. from Havre; Liggett & Meyers Tobacco Co., 75 cs. from Havre, 50 cs. from Marseilles; American Tobacco Co., 254 cs. from Havre, 600 cs. from Bordeaux; Herman Lips, 65 cs. from Havre, 84 cs. from Marseilles; Gluckmann & Co., 7 cs. from Havre; Bernard, Judae & Co., 5 cs. from Havre; Rose & Frank Co., 20 cs. from Havre; M. Shuyel, 34 cs. from Genoa; S. Alexandre, 7 cs. from Bordeaux; E. Duke & Sons Co., 22 cs. from Marseilles; Tobacco Products Corp., 21 cs. from Genoa.

Hanging

Goodbar & Goodwin, 2 cs. from Havre; W. H. S. Lloyd & Co., 6 bls. from Liverpool; R. F. Lang, 69 pkgs. from London; A. Murphy & Co., 6 bls. from Liverpool; C. Konishi & Co., 6 cs. from Tokio; R. F. Downing & Co., 14 bls. from London; A. C. Dodman, Jr., 53 bls. from Liverpool; A. E. Buckley, 2 cs. from Liverpool; Order, 67 bls. from London.

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C. L. LaBOITEAUX CO.
Cincinnati Chicago Cleveland New York

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PAPER BOX BOARDS
— FOR —
Folding Boxes, Set Up Boxes, Paper Cans, Shipping Containers, Etc.

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Single and Double Manila Lined News and Chip Board
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Clay Coated Folding Box Board
Solid Manila Tag Board
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Pasted Container Board
Bristol Ticket Board
Diamond Wall Board
Champion All Leather Heel Board
Also other standard and special grades to order

PAPER MILLS

WE have a selling capacity twice our supply, and are in the market for paper in large volume, and would like to hear from you.

Our competent selling organization has from the beginning always demanded an ever increasing supply. We are at present all sold up and looking around for more, and are now in the market for five thousand tons in several grades.

We would be glad to hear from you what tonnage you can give us during this year. Write us.

Interstate Pulp & Paper Co., Inc.
Grand Central Terminal, New York City

YOUR PRODUCTION!

$$P = \frac{WTS}{600} - B$$

P=Production of salable paper in lbs. per hour.
W=Weight in lbs. of one ream (24 x 36-500).
T=Trim of paper in inches.
S=Speed of machine in feet per minute.
B=Lbs. per hour of paper lost in breaks or made unfit for sale.

Of the factors in the above formula by which you can determine YOUR production, T and W are fixed at predetermined values. But the values of S and B are variable and depend upon the equipment of the machine. Suction Rolls increase S and almost entirely eliminate B. The value of P then becomes much greater. Isn't that what YOU desire?

The Sandusky Foundry & Machine Co.
Sandusky, Ohio

Paper Mill Machinery

The
NOBLE & WOOD MACHINE CO.
HOOSICK FALLS, N. Y.

Filter

P. H. Petry & Co., 22 cs. from Gothenburg; Lunham & Moore, 25 cs. from London; J. Manheimer, 98 bls. from Bordeaux; E. Fougera & Co., 61 cs. from Bordeaux; C. G. Euler, 90 bls. from Bordeaux.

Tissue

Wilkinson Bros. & Co., 13 bls. from Manchester, 7 cs. from Liverpool; Wilfred, Schade & Co., 2 pkgs. from Liverpool; Meadows, Wye & Co., 4 bls. from Liverpool; W. A. Foster & Co., 3 cs. from Liverpool.

Printing

B. F. Drakenfeld & Co., 59 cs. from Liverpool; Oxford University Press, 25 cs. from Liverpool; Order, 565 rolls from Gothenburg.

Wrapping

Citizens National Bank, 144 rolls from Gothenburg.

Miscellaneous

Snows, Ltd., 4 cs. from Havre; International Forwarding Co., 112 cs. from Hamburg; R. F. Downing & Co., 13 cs. from Antwerp, 4 cs. from Hamburg; Worthington & Co., 2 cs. from Havre; Loeb & Schoenfeld Co., 14 cs. from Havre; Goldman, Sachs & Co., 16 bls. from Marseilles; A. Murphy & Co., 11 bls. from Havre; Chatham & Phenix National Bank, 13 cs. from Havre; J. J. Gavin & Co., 2 cs. from Liverpool; U. S. Forwarding Co., 9 cs. from Rotterdam; Rikkers Bros., 31 cs. from Rotterdam; Mansell, Hunt, Catty Co., 2 cs. from London; Willis & Clements, 2 cs. from Liverpool; Keuffel & Esser Co., 23 cs. from Rotterdam; Japan Paper Co., 2 cs. from London, 13 cs. from Havre; Maurice O'Meara Co., 122 bls. from Christiania; Franklin Simon & Co., 4 cs. from Havre; C. B. Richard & Co., 6 cs. from Havre, 5 cs. from Hamburg; American Express Co., 2 cs. from Southampton; C. H. Boulin, 4 cs. from Bordeaux; Luncke & Buechuer, 3 pkgs. from Havre; P. Puttmann, 336 cs. from Antwerp; Favor, Ruhl & Co., 5 cs. from London; Miller & Wright Paper Co., 7 cs. from Rotterdam; Irving National Bank, 16 cs. from Antwerp; Meadows, Wye & Co., 2 cs. from Southampton; G. W. Sheldon & Co., 2 cs. from Bremen; A. T. Bosselman & Co., 4 cs. from Bremen; Transatlantic Shipping Co., 2 cs. from Hamburg; United Fruit Co., 600 bls. from Rotterdam; Davies, Turner & Co., 24 cs. from Rotterdam; Blauvelt Wiley Paper Co., 24 bls. from Glasgow; W. Fiegel, 5 pkgs. from Hamburg; National City Bank, 43 cs. from Hamburg; Bendix Paper Co., 19 cs. from Hamburg; Lunham & Moore, 7 cs. from London; Salomon Bros. & Co., 16 bls. from Rotterdam; Penn Export Corp., 225 rolls from Rotterdam; C. A. Stern & Co., 27 cs. from Rotterdam; Henry Lindenmeyr & Sons, 7 pkgs. from Rotterdam; Order, 25 cs. from London, 8 cs. from Yokohama.

We Can Still Offer

A 20-Ton and a 50-Ton Board Mill, also Two 6-Ton Bogus, Straw or Tissue Mills, 10-Ton Tissue Mill; also Two-Fibre, Binders' or Leather Board Mills, 4-Ton, 5-Ton production, Textile and Colored Specialty Mill, 6-Ton production. Exceptional opportunity.

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No. 261 Broadway, New York City

Telephone: Barclay 8020

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Real Service

If you are interested in obtaining real service in purchasing or disposing of paper mill property or equipment, we are exceptionally well qualified for the work.

Our concern has been in the paper mill machinery business for thirty years and has an enviable reputation, and a staff including:

One who has had an experience of thirty years purchasing, selling and dismantling paper mills and paper mill machinery, and who is acquainted with a majority of the mills of the country;

One who is a Technology graduate, has had ten years' experience in some of the best paper mills and who was superintendent of a high grade mill for five years;

Two Technology graduates with engineering training.

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175 Richdale Avenue, Cambridge, Mass.

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is making records that we are proud of on many paper machines.

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Paper Makers Chemical Co.
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Western Paper Makers Chemical Co.
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Eastern Paper Makers Chemical Co.
WATERTOWN, N. Y

Paper Makers Importing Co.
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Special Price for Quantity.

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Protects your Shipments from damage by moisture while in storage or transit

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WE ALSO MAKE WAX PAPERS, ALL WEIGHTS, IN SHEETS OR ROLLS

Write for Samples

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Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ADHESIVES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

ACID RESISTING BRONZE
Sandusky Foundry & Machine Co., Sandusky, Ohio.
William A. Hardy & Sons, Fitchburg, Mass.

AGITATOR EQUIPMENT
The Hill Clutch Co., Cleveland, Ohio.
Moore & White Co., Philadelphia, Pa.

AIR CONDITIONING AND CONTROL APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ANGLE VALES
The Crane Company, Chicago, Ill.

ARCHITECTS
James L. Carey, 208 N. Laramie St., Chicago.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

ASSORTING TABLES
Moore and White Co., Philadelphia, Pa.

ASH CONVEYOR SYSTEMS
American Steam Conveyor Corp., Chicago, Ill.

BALING PRESSES
Ohio Cultivator Co., Belleville, O.

BARKERS
Carthage Machine Co., Carthage, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.

BARK SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

BEATER BARS
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER BED PLATES
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER ROLL FILLING
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATING, WASHING AND BLEACHING ENGINES
Dayton Beater & Hoist Co., Dayton, Ohio.
Holyoke Machine Co., Holyoke, Mass.
Noble & Wood Machine Co., Hoosick Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

BEATERS (Continuous)
Claflin Engineering Co., Lancaster, Ohio.
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.
Bird Machine Co., East Walpole, Mass.

BELTING (Rubber)
United States Rubber Co., New York and Chicago

BELT CONVEYORS
The Jeffrey Mfg. Co., Columbus, O.
Robins Conveying Belt Co., New York City.

BELT DRIVES
The Hill Clutch Co., Cleveland, Ohio.
The Link Belt Co., Chicago, Ill.

BLEACHING (Propellers)
Moore and White Co., Philadelphia, Pa.

BLANKETS
Frank F. Alt., 421 Columbia St., La Fayette, Ind.

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

BOARD MACHINES
Beloit Iron Works, Beloit, Wis.
Valley Iron Works, Appleton, Wis.
Grasselli Chemical Co., Cleveland, Ohio.
A. Klipstein & Co., 644 to 652 Greenwich St., New York City.

DYNAMOS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

BOARDS (Straw)
The C. L. La Boiteaux Co., Cincinnati, O.

BOILERS
J. F. Davis, Chicago.

BOILER FEEDER
The Farnsworth Co., Conshohocken, Pa.

BOILER SETTINGS
McLeod & Henry Co., Troy, N. Y.

BRASS TUBES
Wheeler Condenser & Engineering Co., Carteret, N. J.

BRASS WIRE CLOTH
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.

BROKERS & FORWARDING AGENTS
Premier Shipping Co., 32 Broadway, N. Y. C.

BRIMSTONE
Union Sulphur Co., 17 Battery Place, New York City.

BRONZE CASTINGS
Eastwood Wire Mfg. Co., Columbus, O.

BRONZE JACKETS
Sandusky Foundry & Machine Co., Sandusky, Ohio.

BUNDLING SYSTEMS
Signode System, Lake St., Chicago

CALENDERS
Beloit Iron Works, Beloit, Wis.
Holyoke Machine Co., Holyoke, Mass.

CALENDER DOCTORS
Ticonderoga Machine Works, Ticonderoga, N.Y.

CALENDER ROLLS
Holyoke Machine Co., Holyoke, Mass.
B. F. Perkins and Son, Inc., Holyoke, Mass.

CASEIN
J. A. & W. Bird & Co., 88 Pearl St., Boston, Mass.
The Kalbfleisch Corp., 31 Union Square, N. Y. C.

CAST IRON PIPE
U. S. Cast Iron Mfg. Co., Pittsburgh, Pa.
Cast Iron Publicity Bureau, New York City.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CAUSTICIZING APPARATUS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CENTRIFUGAL PUMPS
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.
Valley Iron Works Co., Appleton, Wis.
Wheeler Condenser & Engineering Co., Carteret, N. J.

CHEMICALS
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
The Grasselli Chemical Co., Cleveland, Ohio.
A. Klipstein & Co., 644 to 652 Greenwich St., New York City.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Mathieson Alkali Works, Inc., New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

CHIP CRUSHERS
Carthage Machine Co., Carthage, N. Y.

CHIPPERS
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.

CHIPPER AND BARKER KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

CHIP SCREENS
Carthage Machine Co., Carthage, N. Y.

CLAYS AND FILLERS
Binney & Smith Co., 81 Fulton St., N. Y. C.
J. A. & W. Bird & Co., 88 Pearl St., Boston, Mass.
Daniel M. Hicks, 200 Fifth Ave., New York City.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
International Pulp Co., 41 Park Row, N. Y. C.
Miner-Edgar Co., 30 Church St., New York City.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
The John W. Higman Co., Inc., 29 Broadway, New York City.
R. T. Vanderbilt Co., 50 E. 42nd St., New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

COAL BUNKERS
The Brownhoist Co., Cleveland, Ohio.
The Jeffrey Mfg. Co., Columbus, O.

COAL & ASH HANDLING SYSTEMS
Godfrey Conveyor Co., 119 13th St., Elkhart, Ind.
The Jeffrey Mfg. Co., Columbus, O.

COATED PAPERS
Bardeen Paper Co., Otsego, Mich.
Bermingham & Prosser, Chicago, Ill.
Bryant Paper Co., Kalamazoo, Mich.
Monarch Paper Co., Kalamazoo, Mich.
Seaman Paper Co., Chicago, Ill.

CONDENSING EQUIPMENT
Wheeler Condensing & Engineering Co., Carteret, N. J.

CONSTRUCTION (Building)
The Aladdin Co., Bay City, Mich.

CONSULTING ENGINEERS
James L. Carey, 208 N. Laramie St., Chicago, Ill.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

CONSULTING ENGINEERS (Power)
J. F. Carrigan Engineering Co., 504 Cunard Bldg., Chicago.

CONVEYORS
Godfrey Conveyor Co., 119 13th St., Elkhart, Ind.
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Portable Machine Co., Passaic, N. J.
Robins Conveying Belt Co., New York City.

COOLING TOWERS
Wheeler Condenser & Engineering Co., Carteret, N. J.

COPPER TUBES
Wheeler Condenser & Engineering Co., Carteret, N. J.

CRANES
The Brownhoist Co., Cleveland, Ohio.
John F. Byers Co., Ravenna, Ohio.
Northern Engineering Works, Detroit, Mich.
The Chisholm-Moore Mfg. Co., Cleveland, O.
The Link Belt Co., Chicago, Ill.

CRUSHERS (Coal)
The Jeffrey Mfg. Co., Columbus, O.

CYLINDER MOLDS
Appleton Wire Works, Appleton, Wis.
Beloit Iron Works, Beloit, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
The Lindsay Wire Weaving Co., Cleveland, O.
Joseph O'Neill Wire Works, Southport, Conn.
The W. S. Tyler Co., Cleveland, Ohio.

DANDY ROLLS
Appleton Wire Works, Appleton, Wis.
Central Mfg. Co., Kalamazoo, Mich.
Cheney Bigelow Wire Works, Springfield, Ohio.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, Ohio.
The W. S. Tyler Co., Cleveland, Ohio.

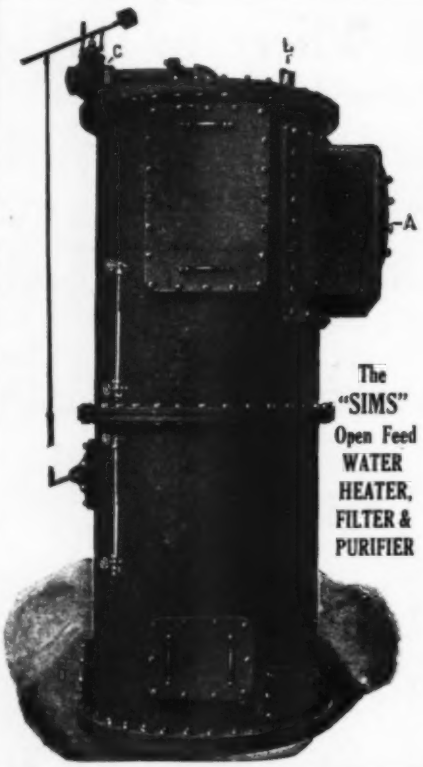
DECKEL FRAME SUPPORTS
Huband and Nash, Menasha, Wis.

DERRICKS
Continental Bridge Co. Chicago, Ill.

DRUM WINDERS
Beloit Iron Works, Beloit, Wis.
Ticonderoga Machine Co., Ticonderoga, N. Y.

DRYER FELTS
Albany Felt Co., Albany, N. Y.
Appleton Woolen Co., Appleton, Wis.
F. C. Huyck & Sons.
Shuler and Benninghofen, Hamilton, Ohio.

DYESTUFFS
Binney & Smith, 81-83 Fulton St., N. Y. City.
E. I. Du Pont de Nemours & Co., Wilmington, Del.



The "SIMS" Open Feed WATER HEATER, FILTER & PURIFIER

WHEN you buy a water heater, or anything else for that matter, you do not actually buy a water heater, but what it will do.

"SIMS" Open Feed Water Heater, Filter and Purifier is the product of Modern Engineering Science and has met the demand for greater efficiency.

OPEN FEED construction is the most simple and effective principle of feed water heating and has less maintenance troubles and operating costs than any other type.

WATER HEATER feeds your boilers with hot water, reduces the strain from contraction and expansion due to feeding cold water and effects a saving of approximately 14.5% in fuel.

FILTER the feed water in a filtering chamber containing hard coke of suitable size as the filtering medium.

and PURIFIER Water containing earthy matter and carbonate of lime when heated close to the boiling point is thrown out of solution into suspension and is removed by the filter.

Is installed you GET the service you bought

Ask us about the "Sims" feed-water heaters.

THE SIMS COMPANY

"We Keep Others in Hot Water."

ERIE PENNA.

THE SCOOP CONVEYOR
OVER 2000 IN USE
SAVES TIME AND LABOR — ENABLES MEN TO WORK EFFICIENTLY IN UNLOADING OR LOADING CARS OR TRUCKS. REPLACES FROM 6 TO 12 MEN
Keeps Equipment Moving
Saves Car Demurrage
WRITE FOR LITERATURE
PORTABLE MACHINERY CO.
PASSAIC, N.J.
R.&P.
1880

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

DUST COLLECTING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ELECTRICAL ENGINEER
Wm. D. Kurz, Appleton, Wis.

ELECTRIC HOISTS
John F. Byers Machine Co., Ravenna, Ohio.
Link-Belt Co., Chicago, Ill.
Northern Engineering Co., Detroit, Mich.

ELECTRIC MACHINERY
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.

ELEVATORS
The Jeffrey Mfg. Co., Columbus, O.

ELEVATORS (Portable)
The Jeffrey Mfg. Co., Columbus, O.

ENGINES
Ball Engine Co., Erie, Pa.
The Brownell Co., Dayton, O.
Chandler and Taylor, Indianapolis, Ind.
Hooven, Owens, Rentschler Co., Hamilton, Ohio.

ENGINEERS
James L. Carey, 208 North Laramie St., Chicago, Ill.
John F. Carrigan, Chicago, Ill.
George F. Hardy, 309 Brodway, New York City.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

ENGINEERS (Testing)
Widney Test Laboratories, Chicago, Ill.

EVAPORATORS:
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Charles Ordway, 25 Church St., N. Y. City.
Swenson Evaporator Co., Chicago, Ill.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Zaremba Co., Buffalo, N. Y.

EXHAUSTERS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

FANS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

FELTS AND JACKETS
Albany Felt Co., Albany, N. Y.
Appleton Woolen Co., Appleton, Wis.
F. C. Huyck & Sons, Albany, N. Y.
Shuler and Benninghofen, Hamilton, Ohio.

FELT AND WIRE GUIDES
Huband and Nash, Menasha, Wis.
Moore & White Co., Philadelphia, Pa.

FIBROUS PEARL FILLER
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

FILTER (Continuous Suction)
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

FILTERS (Pressure and Gravity)
Graver Corporation, East Chicago, Ind.
Hungerford & Terry, Inc., Philadelphia, Pa.

FIRE BRICK
Oliver Bros., 97 Warren St., New York City.

FOURDRINIER WIRES
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, Ohio.
Joseph O'Neill Wire Works, Southport, Conn.
The W. S. Tyler Co., Cleveland, Ohio.

FRICTION CLUTCHES
The Hill Clutch Co., Cleveland, Ohio.
Moore and White Co., Philadelphia, Pa.

FURNACE ARCHES
McLeod & Henry Co., Troy, N. Y.

FUSES
Economy Fuse & Mfg. Co., Kinzie and Orleans Sts., Chicago, Ill.

GEARS
The Hill Clutch Co., Cleveland, Ohio.

GLUES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

GRINDERS
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works, Appleton, Wis.

HEATERS (Feed Water)
Graver Corporation, East Chicago, Ind.
The Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.

HOISTING AND CONVEYING SYSTEMS
John F. Byers Machine Co., Ravenna, Ohio.
The Chisholm-Moore Mfg. Co., Cleveland, Ohio.
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Northern Engineering Co., Detroit, Mich.
Robins Conveying Belt Co., New York City.

HOSE
United States Rubber Co., Chicago, Ill.

HYDRAULIC TURBINES
Holyoke Machine Co., Holyoke, Mass.
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

INDUSTRIAL HOUSES
The Aladdin Co., Bay City, Mich.

INSTRUMENTS (Testing)
Widney Test Laboratories, Chicago, Ill.

IRON CASTINGS
Beloit Iron Works, Beloit, Wis.
Valley Iron Works Co., Appleton, Wis.

JORDAN FILLINGS
J. W. Bolton & Sons, Inc., Lawrence, Mass.

KNIVES
E. C. Atkins & Co., Indianapolis, Ind.
John W. Bolton & Sons, Inc., Lawrence, Mass.
Simonds Manufacturing Co., Fitchburg, Mass.

LAYBOYS
Moore and White Co., Philadelphia, Pa.

KNIFE GRINDING MACHINERY
Machinery Co. of America, Big Rapids, Mich.

LIGHTING EQUIPMENT
Benjamin Electric Co., Chicago, Ill.

LINE SHAFT BEARINGS
The Hill Clutch Co., Cleveland, Ohio.

MACHINE DRYER TEMP. CONTROL
Open Coil Heater and Purifier Co., Indianapolis, Ind.
Valley Iron Works, Appleton, Wis.

MAGNETIC PULLEYS
Magnetic Mfg. Co., 766 Windlake Ave., Milwaukee, Wis.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

MECHANICAL PULP
J. Andersen & Co., 21 E. 40th St., New York City.

MECHANICAL STOKERS
Sanford Riley Stoker Co., Worcester, Mass.

METERS (Gasoline)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

MILL ARCHITECTS
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

MOISTURE TESTER
Williams Apparatus Co., Watertown, N. Y.

MOTORS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

OIL FILTRATIONS & CIRCULATING SYSTEMS
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

OIL HANDLING AND STORING EQUIPMENT
The Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

PAINTS
Cheesman-Elliot Co., Inc., Brooklyn, N. Y.
Detroit Graphite Co., Detroit, Mich.
The Tropical Paint & Oil Co., Cleveland, O.

PAPER BOARDS
The C. L. La Boiteaux Co., 200 Fifth Ave., N. Y.
Strehl Otens Co., Inc., New York-Chicago.

PAPER CUTTERS & SLITTERS
Beloit Iron Works, Beloit, Wis.
Hamblet Machine Co., Lawrence, Mass.

PAPER DISTRIBUTORS
Bermingham and Prosser, Chicago, Ill.
H. G. Craig & Co., New York City.
Berton C. Hill Co., New York City.
Maurice O'Meara, New York City.
Seaman Paper Co., Chicago, Ill.

PAPER EXPORTERS AND IMPORTERS
Gatti-McQuade Co., 200 Fifth Ave., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Main Paper Stock Co., 23-31 Peck Slip, New York City.
New York Overseas Co., 17 Battery Place, New York City.
Interstate Pulp and Paper Co., Grand Central Bldg., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.
Parsons Trading Co., 17 Battery Place, N. Y. C.

PAPER MACHINES
Beloit Iron Works, Beloit, Wis.

PAPER MANUFACTURERS
American Writing Paper Co., Holyoke, Mass.
Bardeen Paper Co., Otsego, Mich.
Eastern Manufacturing Co., 501 Fifth Ave., N. Y. City.
Hammermill Paper Co., Erie, Pa.
Lakeside Paper Co., Neenah, Wis.
Lincoln Paper Mills, Elkhart, Ind.
Marathon Paper Co., Rothschild, Wis.
Munising Paper Co., Munising, Mich.
Northern Paper Mills, Green Bay, Wis.
Oxford Paper Co., 200 Fifth Ave., N. Y. City.
State Pulp & Paper Co., New York City.
Wausau Sulphate Fibre Co., Mosinee, Wis.
Wolverine Paper Co., Otsego, Mich.

PAPER MANUFACTURERS' SUPPLIES
J. Andersen & Co., 21 East 40th St., New York City
The Robert Andrews Co., 115-117 Franklin St., New York City.
Vito G. Cantasano & Bros., 185 South St., New York City.
Craig-Becker Co., 52 Vanderbilt Ave., N. Y. City.
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Francis Hughes Co., 21st St. and Loomis Ave., Chicago.
Invincible Paper & Pulp Corporation, 135 Broadway, N. Y. City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Martin Spinelli, 132 Nassau St., New York City.
Main Paper Stock Co., 25-31 Peck Slip, New York City.
Mendelson Bros. Paper Stock Co, 910 Michigan Ave., Chicago.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Paper Makers' Chemical Co., St. Austell, England.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
A. Salomon, Inc., New York City.
Salomon Bros. & Co., 200 Fifth Ave., N. Y. C.
Spinelli, Martin, Brooklyn, N. Y.
Steele By-Products Co., Chicago.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

PAPER MILL BROKERS
Frank H. Davis, 175 Richdale Ave., Cambridge, Mass.
Gibbs-Brower Co., 261 Broadway, N. Y. C.

PAPER STOCK CUTTERS
Taylor, Stiles & Co., Riegelsville, N. J.

PAPER PULPING ENGINES
Noble & Wood Machine Co., Hoosick Falls, N. Y.

PAPER AND PULP MILL MACHINERY
Beloit Iron Works, Beloit, Wis.
The Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.

PAPER TESTERS
Widney Test Laboratories, Chicago, Ill.

"Sensation" High Speed Belt

Maker of **Service Records**

Based directly on a distinct departure in belting construction

No Belt Has shown the tensile strength,
The compact, inseparable plies,
The elimination of stretch,
The close pulley contact,
The resistance to frictional heat and climatic variations that "Sensation" has demonstrated

Its many features stand out in Paper Mill drives.

"*Sensation*" is a belt you will be glad to run, at a price you will willingly pay.

MADE EXCLUSIVELY BY

Voorhees Rubber Manufacturing Co.

Jersey City, New Jersey

HOME OF THE FAMOUS RUB-STEEL PUMP VALVE

"Boys, This Will Pay Our Salaries!"

This is what the General Manager of one of the largest paper mills in this country said to the Superintendent and Boss Machine-tender after installing a

WILLIAMS STANDARD PAPER MOISTURE TESTER

Was He Right?

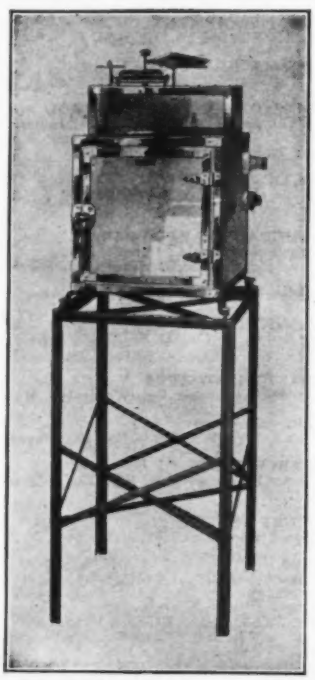
Figure it out. You know your production. If you are shipping out your paper 2 or 3 per cent too dry, figure your loss in tonnage to which you are entitled. (Tests at one mill showed a variation of 8% in moisture content.)

Other losses are:

Fuel loss in over-drying.

Production loss due to more breaks in over-dry paper.

Is over-dry paper more satisfactory to your customer? NO.



Description

A compact apparatus which will give you in 10 minutes the exact moisture of content of your paper as it comes off the machine.

Accurate to .1 of 1%.

No special skill required to operate. Anyone who can weigh roll paper or get the base weight of a sample can operate it.

Double walled electric oven with thermostat control, accurate scales, with beam graduated to read % of moisture directly. No calculation required.

Tests all kinds of paper from tissue to board.

WILLIAMS APPARATUS CO.

Send today for descriptive matter

PARK PLACE **Watertown, N. Y.**

Every Paper Mill Can Profitably Use One or More of These Outfits. In Some Mills, One Will PAY FOR ITSELF IN ONE DAY.

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

PARCHMENT MANUFACTURERS
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Sutherland Paper Co., Kalamazoo, Mich.

PIPE BENDING
American Pipe Bending Co., Boston, Mass.

PIPING EQUIPMENT
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PIPING SYSTEMS INSTALLED
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PLUG MACHINES
Carthage Machine Co., Carthage, N. Y.

PNEUMATIC CHIP HANDLING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

POWER INSTRUMENTS
The Manning Gauge Co., Inc., 77 Traverse St., Boston, Mass.

POWER TRANSMISSION
Dodge Sales & Engineering Co., Mishawaka, Ind.
Link-Belt Co., Chicago, Ill.
The Hill Clutch Co., Cleveland, Ohio.
Valley Iron Works, Williamsport, Pa.

PUBLISHERS
The Chemical Catalog Co., New York City.
Ravenswood Press Pub. Co., Chicago, Ill.

PULP (Chemical)
J. Andersen & Co., 21 East 40th St., New York City.
Craig-Becker Co., 52 Vanderbilt Ave., N. Y. City.
M. Gottesman & Co., 18 E. 41st St., New York City.
Daniel M. Hicks, 200 Fifth Ave., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Price & Pierce, Ltd., 30 East 42nd St., New York City.
The Pulp & Paper Trading Co., 21 East 40th St., New York City.
Scandinavian-American Trading Co., 50 East 42d St., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.

PULP EXTRACTORS
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.

PULP AND PAPER MACHINERY
Beloit Iron Works, Beloit, Wis.
Bird Machine Co., East Walpole, Mass.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Co., Glens Falls, N. Y.
Moore & White Co., Philadelphia, Pa.
Union Iron Works, Bangor, Me.
Valley Iron Works, Appleton, Wis.

PULP GRINDERS
Carthage Machine Co., Carthage, N. Y.
Union Iron Works, Bangor, Me.

PULP LAP SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

PULP SHREDDERS
Carthage Machine Co., Carthage, N. Y.

PUMPS (Stock)
Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.
Carthage Machine Co., Carthage, N. Y.
Glens Falls Machine Co., Glens Falls, N. Y.

PUMPS (Centrifugal)
Wheeler Condenser & Engineering Co., Carteret, N. J.

PUMPS (Gasoline)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

PUMPS (Vacuum)
American Steam Pump Co., Battle Creek, Mich.
Buffalo Foundry and Machine Co., Buffalo, N. Y.
Dean Bros., Indianapolis, Ind.
Wheeler Condenser & Engineering Co., Carteret, N. J.

RAG AND PAPER DUSTERS
Holyoke Machine Co., Holyoke, Mass.

RAG CUTTERS
B. F. Perkins & Son, Inc., Holyoke, Mass.

REFLECTORS
Benjamin Electric Co., Chicago, Ill.

ROTARY VACUUM PUMPS
Sandusky Foundry & Machine Co., Sandusky, O.

RUBBER ROLLS
United States Rubber Co., New York and Chicago

ROOF TRUSSES
Continental Bridge Co., Chicago, Ill.

ROTARY SCREEN
Bird Machine Co., East Walpole, Mass.

SAVE-ALLS
Bird Machine Co., East Walpole, Mass.
Glens Falls Machine Co., Glens Falls, N. Y.

SAWS
E. C. Atkins & Co, Indianapolis, Ind.
Simonds Manufacturing Co., Fitchburg, Mass.

SCREENS
Bird Machine Co., East Walpole, Mass.
Shartle Bros. Mach. Co., Middletown, O.
Union Iron Works, Bangor, Me.

SCREEN PLATES
Central Mfg. Co., Kalamazoo, Mich.
William A. Hardy & Sons, Fitchburg, Mass.

SCREEN DIAPHRAGMS
United States Rubber Co., Chicago, Ill.

SECOND HAND MACHINERY
Frank H. Davis, 175 Richdale Ave., Cambridge, Mass.

SHAKE (Fourdrinier Cushion)
Wm. C. Nash, Neenah, Wis.

SHOWER PIPES
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SILENT CHAIN DRIVES
The Link Belt Co., Chicago, Ill.

SIZING SYSTEMS
Eastern Paper Makers' Chemical Co., Watertown, N. Y.
Paper Makers' Chemical Co., Easton, Pa., and Holyoke, Mass.
Process Engineers, New York City.
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

SLITTING AND REWINDING MACHINERY
Beloit Iron Works, Beloit, Wis.
Hamblet Machine Co., Lawrence, Mass.
Samuel M. Langston Co., Camden, N. J.

SOOT BLOWERS
Diamond Power Specialty Co., Detroit, Mich.

SPEED CHANGES
Moore and White Co., Philadelphia, Pa.

STEAM JET CONVEYORS
American Steam Conveyor Corp., Chicago, Ill.

STOCK CIRCULATING SYSTEM
Claflin Engineering Co., Lancaster, Ohio.
Ticonderoga Machine Works, Ticonderoga, N.Y.

STOCK PUMPS
Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.

SUCTION ROLLS
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SULPHITE MACHINERY
Stebbins Engineering Co., Watertown, N. Y.

SULPHUR
Union Sulphur Co., 17 Battery Place, New York City.

SULPHUR BURNERS
Carthage Machine Co., Carthage, N. Y.
Valley Iron Works Co., Appleton, Wis.

TANKS (Oil Storage)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.
Graver Corporation, East Chicago, Ind.

TANKS (Steel)
Graver Corporation, East Chicago, Ind.

TANKS (Welded)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

TANKS (Water Storage)
Graver Corporation, East Chicago, Ind.

TESTERS (Moisture)
Williams Apparatus Co., Watertown, N. Y.

TUBING
Wheeler Condensing & Engineering Co., Carteret, N. J.

TURBINES (Hydraulic)
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

VACUUM SYSTEMS
Open Coil Heater and Purifier Co., Indianapolis, Ind.

VALVES
Carthage Machine Co., Carthage, N. Y.
The Crane Co., Chicago, Ill.
G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, Ill.
The Wm. Powell Co., Cincinnati, Ohio.
Voorhees Rubber Mfg. Co., Jersey City, N. J.

VALVES (Strainer)
Bird Machine Co., East Walpole, Mass.

VAPOR ABSORPTION SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

VARIABLE SPEED ENGINES
Ball Engine Co., Erie, Pa.
The Brownell Co., Dayton, Ohio.
Chandler and Taylor, Indianapolis, Ind.
Hooven, Owens, Rentschler Co., Hamilton, O.

VENTILATING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Perkins & Son, Inc., Holyoke, Mass.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

WASHER WIRES
The W. S. Tyler Co., Cleveland, Ohio.

WASTE PAPER STOCK
Francis Hughes Co., 21st and Loomis Street, Chicago.
Main Paper Stock Co., 23-31 Peck Slip, New York City.
F. G. Marquardt, Inc., 345 Broadway, N. Y. C.
Martin Spinelli, 132 Nassau St., New York City.
Mendelson Bros. Paper Stock Co., 910 S. Michigan Blvd., Chicago, Ill.
Salomon Bros. & Co., 200 Fifth Ave., N. Y. C.

WATCHMAN'S CLOCKS
Chicago Watchman's Clock Works, 1526 Wabash Ave., Chicago.

WATER FILTER
Hungerford & Terry, Inc., Philadelphia, Pa.
Glens Falls Machine Co, Glens Falls, N. Y.

WATER HEATERS:
Graver Corporation, East Chicago, Ill.
The Sims Co., Erie, Pa.

WATERPROOF LINING
The National Waterproofing Co., Philadelphia, Pa.

WATER-SOFTENING AND PURIFYING SYSTEMS
Graver Corporation, East Chicago, Ind.
Wm. B. Scaife and Sons Co., Oakmont, Pa.

WATER WHEELS
James Leffel and Co., Springfield, Ohio.
Holyoke Machine Co., Holyoke, Mass.
S. Morgan Smith Co., York, Pa.

WELDING & CUTTING EQUIPMENT
The Imperial Brass Mfg. Co., 516 So. Racine Ave., Chicago.

WET MACHINES
Carthage Machine Co., Carthage, N. Y.
Valley Iron Works Co., Appleton, Wis.

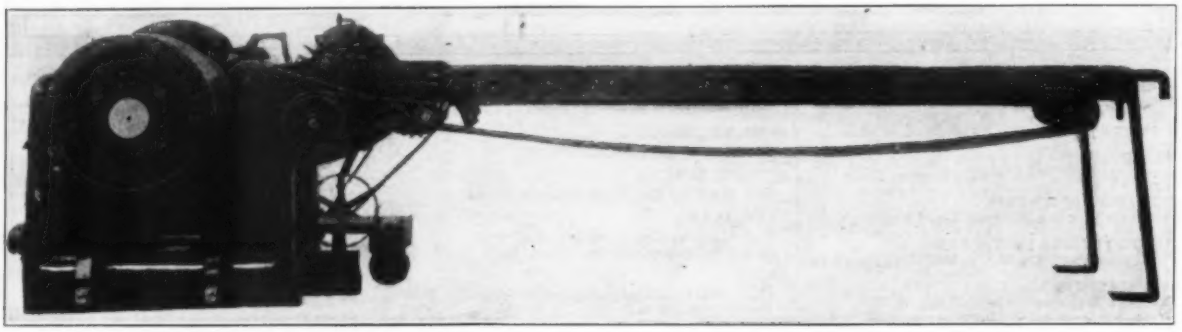
WOOD CHIP SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.

WOOD SPLITTERS
Carthage Machine Co., Carthage, N. Y.

WOOD WASHERS
Carthage Machine Co., Carthage, N. Y.

WIRE SIGNS
Cheney Bigelow Wire Works, Springfield, Mass.

No. 11 "GIANT" PAPER STOCK CUTTER



Capacity 2½ Tons Per Hour
Especially Adapted for Handling Waste Paper, Magazines, Etc., Before Feeding to the Beaters

Whatever You Cut, A GIANT Will Solve Your Problem

LET US FIGURE IT OUT FOR YOU

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Brantford, Ont., Canada
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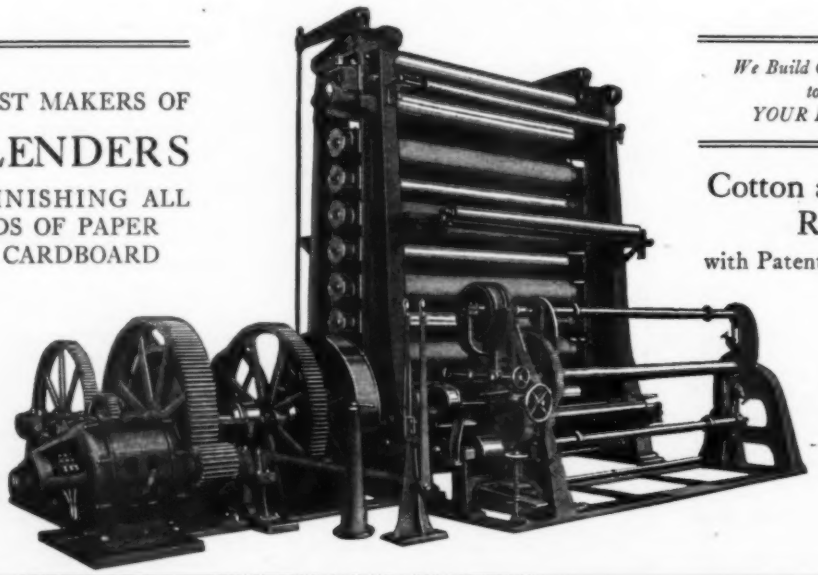
MAKERS OF

Improved Machinery for Wood Pulp, Paper Mills, Paper Converters, Printers and Lithographers

LARGEST MAKERS OF
CALENDERS
FOR FINISHING ALL KINDS OF PAPER *and* CARDBOARD



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Cotton and Paper Rolls
with Patented Fastenings

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Hudson Falls
New York

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"Northern" Inter-Folded Towels
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CAPACITY 100,000 LBS. PER DAY

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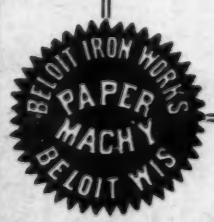
Good-Will

is the probability that the
old customer will return

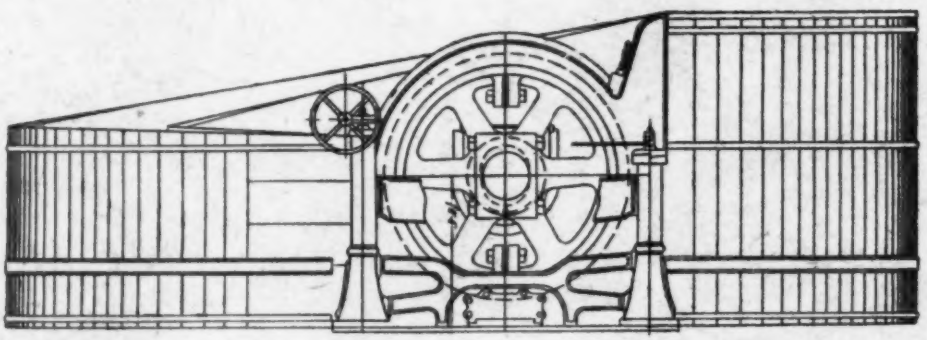
Our shops
are filled
with
Good-Will

BELOIT IRON WORKS
Beloit, Wisconsin, U. S. A.

Builders of Paper Machines
of Worth.



SAVE ON INSTALLATION COST, BEATING TIME, FLOOR SPACE, POWER, MOTORS, BELTING, LABOR



MANY improvements have been attempted on the Holland type of beating engine. As yet, none have been very successful except in a mechanical way. So far as efficiency is concerned, the beater of today is but little in advance of the beater of one hundred years ago.

The "NIAGARA," however, is a real improvement and a long step forward in beating efficiency. Although occupying the same floor space as an ordinary one thousand pound beater, it will handle over two thousand pounds of dry stock and circulate it when at a consistency of eight percent, at the rate of ninety-five feet per minute, or sixty tons per day. This is six times faster than the ordinary beater, and means that one "NIAGARA" will do the work of three Holland engines, thereby effecting a great saving by installing.

The "Niagara" Beater

One installation of one "NIAGARA" is furnishing a one hundred and thirty-two inch machine, and is running only two-thirds of the time.

With these facts before you, can you afford to do your beating in the old manner. A wonderful saving is within your reach. If you have a beating engine problem, write us today.

The Valley Iron Works Co.

APPLETON, WISCONSIN